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E. M. Spruce
June '91

DISEASES OF THE NOSE AND THROAT

Resp. H.

P. S. Spencer
8 Bloor St. East
Toronto

A MANUAL OF DISEASES OF THE NOSE AND THROAT

INCLUDING THE

NOSE, NASO-PHARYNX, PHARYNX, AND LARYNX

BY

PROCTER S. HUTCHINSON, M.R.C.S.

ASSISTANT SURGEON TO THE HOSPITAL FOR DISEASES OF THE THROAT

WITH ILLUSTRATIONS

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PREFACE.

It is with the hope of supplying a useful small book for those who are taking up the post-graduate study of this special branch of medicine, that this work has been written. For the sake of making it as far as possible concise and practical, controversial points have been avoided. The book is rather intended for those whose time is too limited for reading larger works on the subject. Much assistance has been derived from the writings of numerous authors, and specially from those of Mackenzie, Bosworth, and Macdonald. The author is specially indebted to his colleague, Dr. Bond, for kindly allowing him to make drawings from cases under his care.

The few illustrations of instruments, supplied by Messrs. Mayer and Meltzer, were chosen as those most essential for operations on these regions.

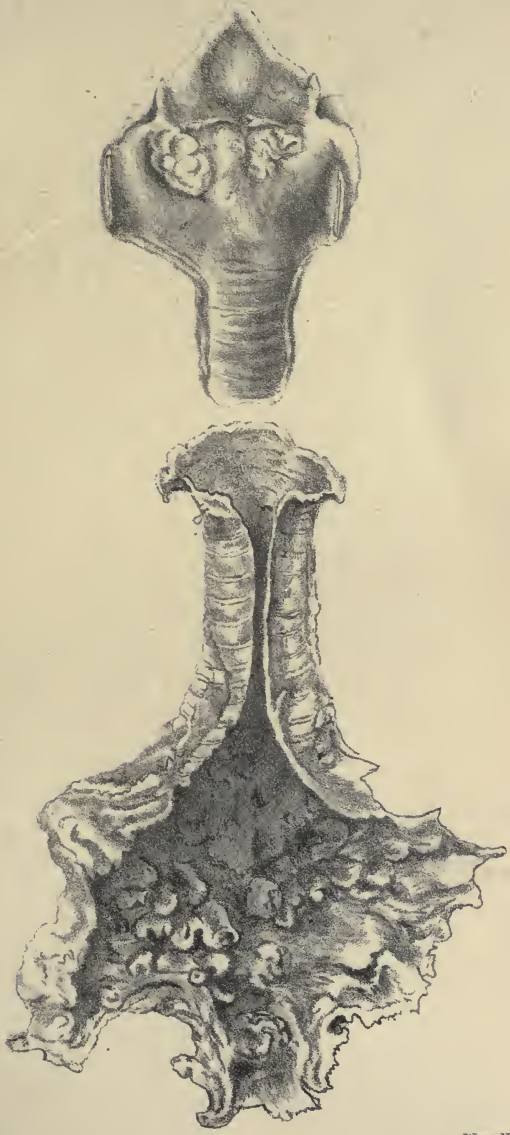
Cavendish Square, W.
February, 1891.

DESCRIPTION OF PLATE I.

FIG. 1. — Growths in the Larynx of a Dog. (From Mackenzie's "*Growths in the Larynx*").

FIG. 2.—Growths in the Trachea of a Dog. (From an original drawing in Mr. Jonathan Hutchinson's possession).

PLATE I.



P.S.H.lith.

West, Newman *imp.*

DESCRIPTION OF PLATE II.

FIG. 1.—Larynx of a "Roarer," showing atrophy of the muscles on the left side. No cause was found for the nerve paralysis.

PLATE II.

P.S.H lith.

West, Newman imp.

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A MANUAL OF DISEASES

OF THE

NOSE AND THROAT.

SECTION I.

Diseases of the Nose and Naso-Pharynx.

Anatomy of the Nasal Fossæ.—Before describing the parts seen in examination of the nose, the most important anatomical points in connection with the study of its diseases may be briefly mentioned. Owing to the thickness of the lining mucous membrane the cavity of the nose is of course greatly reduced compared to what is found in the dried skull. By prolongation of the mucous membrane at its free margins the turbinated bodies, particularly the lower pair, become more prominent and longer from before backwards than exists in the bone. Also by the arrangement of the mucous membrane around and over the orifices opening into the nasal fossæ, some of the bony foramina are narrowed and others completely closed. In the upper meatus the small orifice which leads into the posterior ethmoidal cells is lined by a prolongation of thin mucous membrane which continues into these cavities; but the spheno-palatine foramen is

covered over by the Schneiderian membrane so that no opening exists in the recent nasal fossa.

In the middle meatus the aperture of the infundibulum is nearly hidden by a fold of mucous membrane; it leads into the anterior ethmoidal cells, and through them into the frontal sinus. Below and behind this is the opening of the antrum of Highmore, which is surrounded by a circular fold of mucous membrane (sometimes prominent and even slightly valvular) which leaves a circular aperture much smaller than in the bony meatus.

In the lower meatus the inferior orifice of the nasal duct is protected by one or two folds of mucous membrane.

The pituitary or Schneiderian membrane which lines the cavity of the nose is highly vascular, and is inseparably united with the periosteum and perichondrium over which it lies. It is continuous with the membrane lining the contiguous cavities, and varies considerably in thickness and vascularity. It is thickest over the turbinated bodies (particularly the inferior), and also over the septum it is thick and spongy; but over the floor of the nose, and in the meati, it is considerably thinner. In the maxillary, frontal, and sphenoidal sinuses, and in the ethmoidal cells, the thin and pale mucous membrane contrasts strongly with that occupying the nasal fossæ.

The interior of the nose may be divided by the characters of its mucous membrane into three parts. The region of the external orifice, including that part roofed by the nasal cartilages, is lined by squamous epithelium. The remainder may be divided into the *olfactory* and *respiratory* regions.

The olfactory region includes the upper and middle turbinated portions and the upper part of the septum, and is lined by non-ciliated columnar epithelium. The respiratory region includes the inferior turbinated and lower part of the fossa, and is lined with epithelium both ciliated and columnar. The latter also includes the sinuses.

Recent investigation has thrown considerable light on the mechanism of the erectile power of the inferior turbinated bodies.* The erectile tissue over the inferior turbinated consists of three layers:—(1) the epithelial, (2) the fibro-vascular, and (3) the submucous, in which are the racemose glands and venous sinuses to which the erectile property is due. These sinuses form a loose spongy network, with but little connective tissue between their walls, and from them the veins pursue a more or less direct course towards the surface where they ramify in capillaries with the arterioles. When empty the walls of the spaces become collapsed, and in nearly close contact. In both the fibro-vascular and submucous layers there is a considerable development of elastic tissue which gives the venous network the power of emptying when the blood supply is cut off by contraction of the arterioles. Erection of the turbinated bodies takes place from increased blood-supply causing distension of the capillaries, veins and sinuses. This results particularly under the influence of exposure to cold, and its object seems to be to increase the area of mucous membrane over which the air passes, in this way giving it more warmth and moisture. An

* Macdonald's "Diseases of the Nose," p. 14.

atmosphere supersaturated with moisture appears to have the effect of causing collapse of the erectile tissue. Cocaine probably acts by causing contraction of the arterioles, thus diminishing the blood-supply to the sinuses, which empty themselves by means of their elastic tissue.

Anterior Rhinoscopy.—The most convenient speculum for dilating the anterior nares is Thudichum's; it has the advantages of holding back the hairs at the orifice, while the handle is out of the way for operations, being also self-retaining. It is best to use a speculum with small blades, as large ones cause discomfort to the patient.

FIG. 1.—Thudichum's Speculum.

The parts seen on looking into the anterior nares are the inferior and middle turbinateds on the outside, leaving a slight interval between them and the septum on the inside. The inferior turbinated is seen to project most anteriorly, while partly overlapped by it and relatively further back is the anterior portion of the middle turbinated. No portion of the superior turbinated can, as a rule, be seen from the front. Many persons have more or less asymmetry in the anterior nares, slight deflections or spurs from the septum being frequently seen, without necessarily giving rise to symptoms or requiring operative

treatment. The probe is useful for detecting bare bone, foreign bodies, or ascertaining the attachment of a polypus. It is to be remembered, however, that where the mucous membrane is thin the probe may be easily pushed through it, and give the sensation of grating against bare bone, where no necrosis exists.

The colour of the mucous membrane over the anterior portions of the turbinateds and septum is red; the amount of turgescence of the erectile tissue over the former varies considerably with the varying conditions of the atmosphere, &c.; it can be lessened at once by cocaine, if it be desirable to reduce it, so as to see further into the nose.

Posterior Rhinoscopy.—This method of examining the nose requires considerable practice to become efficient in, the chief difficulty being to focus what is seen in the mirror, so as to get a clear idea of the relation of parts. There are special mirrors contrived for examining this region, but for all practical purposes a small laryngeal mirror (the size of a sixpence) is quite sufficient; it should be used with the right hand, the tongue being depressed with a spatula in the left. The plane of the mirror may be altered by bending the shank of the mirror, according to whether the vault of the pharynx or the posterior nares are to be illuminated. To avoid putting the spatula too far back on the tongue, so as to cause retching is an important point. The patient should be persuaded to breathe through the nose while examination is made. Palate hooks, of which White's self-retaining one is probably the best, may be used; but as a rule cocaine has to be applied first before they are employed.

Examination of the posterior nares in children is rarely possible.

The parts seen in the mirror in posterior rhinoscopy are the posterior extremities of the three turbinated bodies, the orifices and cushions of the Eustachian tubes, the septum and vault of the pharynx. The turbinateds overlap one another from below upwards, the inferior being rounded, while the middle and superior are elongated in shape. The lower border of the inferior turbinated cannot be seen, as it is covered by the edge of the soft palate. Most of the end of the middle turbinated can be seen,

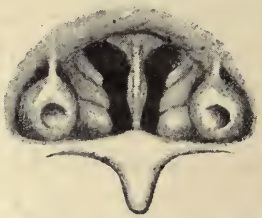

FIG. 2.—Normal view of post-nasal space.

except at its lower part, where it is overlapped by the inferior turbinated. The superior turbinated is only seen to a small extent, and is relatively further back. Two smooth pale projections are frequently seen on the septum, they vary in size in different persons, but are not pathological. The colour of the mucous membrane on the septum and turbinateds is pale; while the vault of the pharynx and Eustachian tubes are red.

The conditions which posterior rhinoscopy is most useful in diagnosing are hypertrophy of the turbinateds, post-nasal vegetations, and polypi far back in the nose.

Foreign Bodies.—Plum-stones, small marbles, peas, beads, etc., are among the foreign bodies introduced into the nose by children. Obstructed respiration, and purulent discharge from one nostril should cause suspicion of a foreign body.

Examination with a probe is the best means of detecting their presence. The anterior nares of a child being too small to allow of a good view being obtained with a speculum.

The nose should be syringed first in the endeavour to remove them, and this is frequently sufficient. If syringing fail, a fine bladed pair of forceps is the best instrument to use.

Acute catarrhal rhinitis is too well-known to need lengthy description. It is essentially a general fever, excited by exposure to draught or damp, and acting in a reflex manner through the nervous system on the nose, throat, or chest. The attack usually commences with a sensation of chilliness, dryness of skin, aching in the head, limbs and back, and sometimes elevation of temperature. The phases in the nose are first hyperæmia, and tumefaction of the mucous membrane, which is at first dry from want of gland secretion. The congested area then soon begins to pour out a thin watery discharge, which subsequently becomes mucopurulent. Besides the general febrile symptoms those specially referable to the upper air-tract are frequent sneezing, loss of smell, stuffing of the nose, deafness from blocking of the Eustachian tubes, headache from implication of the frontal sinuses, and more rarely when the

antrum becomes affected severe pain in the cheek. From the acrid nature of the discharge in the first stage, the orifices of the nostrils are apt to become excoriated. Extension of the inflammation may take place to the lacrymal ducts and conjunctivæ, also to the pharynx, and larynx, etc. As convalescence approaches, the thick discharge becomes gradually thin again, though no longer irritating, and finally ceases. Recovery usually takes place after a few days.

Treatment.—The disease tends to run its own course, and requires no special treatment beyond avoidance of exposure, and other generally well understood measures.

The endeavour to cure the liability to cold catching is important, and anything as regards clothing, exercise, etc., which will conduce to the general health should be considered. The cold morning bath is frequently useful in preventing susceptibility to chills.

Hay Fever.—This acute catarrhal affection of the nose and conjunctiva depends on a susceptibility of the mucous membrane to the pollen of certain plants.

It is most prevalent in Europe during June and July, and in America during August and September. The most active pollens in causing the affection are those of the flowering grasses, of rye, oats, and barley; and also the dust of rose blossoms, originating the term "Rose fever." The greater number of cases occur in young persons. Blackley found the intensity of the disease in direct proportion to the quantity of pollen in the air.

The onset of an attack is characterised by a sense of irritation in the nose, with tightness across the bridge of

the nose, accompanied by sneezing. The eyes water, and occasionally the discomfort extends to the mouth and ears. The mucous membrane then becomes swollen, and secretes more or less profusely a serous exudation. The discharge is very profuse in some cases, and seems to increase the amount of irritation. Vascular dilatation accompanies the discharge, and the stoppage of the nose may be complete. Hypertrophied conditions of the nasal mucous membrane probably lead to the pollen being more easily retained in the nose. Asthma may be set up in the more severe cases. The attacks may last hours, days, or weeks, depending on the susceptibility of the person. Season also exerts an influence, a dry one being more favourable to the spread of the pollen.

Treatment.—Avoidance of the cause by residence in town, at the sea-side, or taking a sea voyage during the time the pollen is prevalent, is the most efficient means of prevention. When this is impossible, and the patient has to reside in the country during the hay season, a pair of spectacles with broad closely fitting brims, and some form of nasal respirator should be worn. A veil sufficiently impervious to keep out the pollen is too hot for summer.

Locally, chromic acid (gr. $\frac{1}{8}$-$\frac{1}{16}$ to ʒ j. water) as a spray for the nose is useful in some cases. Perchloride of mercury (1-3000) has also been recommended. Cocaine though it gives marked temporary relief, is injurious if used over long periods, so that its use is not to be recommended. Nerve tonics such as quinine, nux vomica, and valerianate of zinc may be given.

Chronic Rhinitis.—Frequent cold catching is the

most frequent cause of this condition. Besides this catarrhal cause may be mentioned in children the occurrence of adenoids in the naso-pharynx, or constitutional weakness; and in adults the taking of spirits.

The most prominent symptoms are increased secretion of mucus and stuffiness in the nose. The nose becomes obstructed at night, and results in a dry mouth in the morning. The voice becomes altered if the nose is much obstructed, and acquires a nasal twang. The discharge varies from being thick and muco-purulent to being thin and watery.

The interior of the nose may present redness and swelling of the mucous membrane, with possibly excoriations on the surface; but in a large majority of cases the changes are but slight. Hypertrophy of the mucous membrane is the most marked physical sign; it will be referred to again separately. By irritation of excoriations on the cartilaginous septum perforation may take place.

With chronic catarrh of the nose inflammation of the naso-phraynx is not infrequently also present. In this country it probably results from extension backwards of the nasal catarrh, and from inhalation of dusty particles. A certain amount of naso-pharyngeal catarrh is also present with post-nasal vegetations. The mucus which collects in the naso-pharynx, requires more effort and hawking to remove it than that in the nose; however, frequently the patient is not annoyed by it in the day-time, but complains that it collects in the night.

In America, post-nasal catarrh, from its greater prevalence and severity, deserves to rank as a separate affection

from that met with in this country. It is widely distributed among all classes through the greater part of the United States. Its cause there is probably, as Mackenzie suggests, chiefly the inhalation of dust.* It is characterised by inflammation of the mucous membrane of the nose, and naso-pharynx; with secretion of viscid mucus, which clings to the parts, and requires great effort to dislodge it.

Treatment.—The washing away of the discharge with an alkaline lotion is the most effectual treatment. For this the following formula is useful:—

℞ Sodæ bicarb. gr. xv.
Acid. carbol. gr. 1½
Glycerin. ♏xxx.
Aq. ad ℥j.

It may be sniffed through the nose, or used with a syringe. After the discharge has been removed astringent lotions may be used, such as:—

℞ Alum. gr. iii.
Aq. ℥j.
or Chromic acid (gr. ⅛ to ℥j.).

Astringents should always be used very weak for the nose. A mercurial ointment is sometimes useful, as:—

℞ Hyd. oxid. flav. gr. iij.
Adip. benzoat. ℥j.

to be applied with a brush to the interior of the nose.

Constitutional treatment should also be carried out when indicated.

Rhinorrhœa is a form of chronic rhinitis in which a

* Mackenzie, "Diseases of Throat and Nose," vol. ii., p. 482.

constant watery discharge runs from the nose. It seems to come on independently of frequent cold in the head, and is met with in both sexes. The discharge may necessitate the use of many handkerchiefs in the day. Nothing beyond some hyperæmia is to be noticed on examining the nose. Loss of smell is frequently also present.

Chromic acid (gr. $\frac{1}{8}$ to $\overline{3}$ j. of water) is the most useful remedy in checking the discharge, and may restore the power of smelling. Morphia as a snuff may also be used.

Hypertrophic Rhinitis.—As a result of chronic nasal catarrh, one or other of the turbinated bodies may become hypertrophied, either at its anterior or posterior extremity. The condition is frequently left for some time after a severe cold in the nose and will subside without treatment; at other times the mucous membrane becomes permanently thickened.

When the middle turbinated is chiefly swollen the passage of air taking place along the inferior meatus only results, as Dr. Macdonald* has pointed out, in the air being insufficiently moistened and a dryness in the throat results.

Though the middle turbinated may be affected by true hypertrophy, the inferior turbinated is more frequently so. This may involve the anterior or posterior extremity, or the whole length of its mucous membrane.

Hypertrophy of the anterior portion of the inferior turbinated body is particularly likely to impede nasal respiration when spurs or deflections in the septum are present at the same time. The hypertrophy may be

* "Nasal Obstruction," p. 15.

somewhat pedunculated, and may resemble mucous polypus; the latter, however, usually grow from the middle or upper spongy bone, or the meatus between them. The colour of polypi is also usually pale and translucent looking, while hypertrophy is the colour of the rest of the mucous membrane. The use of the probe will help to differentiate. Cases, however, frequently occur in which the two conditions are present at the same time.

In exceptional instances one turbinated may be so hypertrophied as to push the septum to one side, and to keep the other spongy bone on the same side in a collapsed condition.

FIG. 3.—Hypertrophy of posterior ends of inferior turbinateds.

Hypertrophy of the posterior portions of the inferior turbinated body is to be diagnosed by the rhinoscopic mirror, or where this is impracticable by digital examination. The condition presented may be that of pale œdematous swelling, entirely obstructing nasal respiration, and which may subside spontaneously after a few weeks; this being more frequently a sub-acute condition. Permanent hypertrophy may be seen as smooth enlargement, or with the surface more or less lobulated like a mulberry and of a greyish colour, (aptly compared to the colour of a grub-worm). In more exceptional in-

stances the colour is deep red or purplish. The swelling may be seen projecting against the septum, soft palate, and Eustachian tubes, and concealing these structures to a greater or less extent.

When the hypertrophy involves the whole length of the mucous membrane, polypi are probably more likely to be also present.

The symptoms complained of are stuffiness and difficulty in breathing through the nose, thickness in the speech, and sometimes the dropping of mucus into the throat. Tinnitus and ear symptoms may be set up when the Eustachian tube is pressed upon.

Posterior hypertrophy should be suspected when no obstruction is found in the anterior nares, and when no enlarged tonsils or post-nasal vegetations are found to account for the obstructed respiration.

Treatment.—Hypertrophy of one or other of the turbinated is at first best treated by palliative measures, such as alkaline lotions, etc., all operations in the nose being avoided as far as possible. Removal of the bone itself is particularly to be avoided as it frequently leaves the condition of the patient's nose more uncomfortable than it was previous to the operation.

If, however, the hypertrophy is permanent and is giving rise to much inconvenience it may be reduced by cauterization, or by snaring the hypertrophied mucous membrane when polypoid in nature.

For the first measure the galvano-cautery may be used, a few linear cauterizations being made along the hypertrophied portion. Cocaine (10 per cent.) should first be

employed, and great care must be taken that the septum is not cauterized at the same time, or adhesion may take place between the two. A shield to put against the septum may be used to prevent this, or Dr. Löwenberg's nasal electrode, with the incandescent point, placed on one side may be used, one wire thus protecting the septum.

To snare redundant tissue Mackenzie's wire snare may be used, but for enlargement of the posterior ends of the

Fig. 4.—Cocaine Spray.

turbinateds Macdonald's modification of Jarvis's snare is better. With this instrument the growth is more slowly removed, and hæmorrhage is less likely to result. This latter operation requires the left fore-finger in the post-nasal space to adjust the wire loop passed along the inferior meatus. The manipulation is painful, and an anæsthetic is best employed. These swellings being

sometimes more or less polypoid in character may collapse with escape of watery fluid when the snare is tightened, leaving only a small piece of mucous membrane to be removed.

For those who cannot keep an electric cautery at hand, a saturated solution of chromic acid answers very well.

Fig. 5.—Macdonald's Modification of Jarvis's Snare.

To produce a linear cauterization a little should be applied on a bare probe.

Gum elastic bougies are sometimes useful in reducing the swollen mucous membrane. A small size should be commenced with, and retained at first for only a few minutes.

Atrophic Rhinitis and Ozæna.—These two conditions are so frequently associated that it is convenient

to consider them together, although it should be remembered that a dry atrophic condition of the mucous membrane of the nose may be met with without ozæna. The cause of atrophic rhinitis is extremely difficult to explain, and has given rise to more discussion probably than any other nasal disease.

Though met with in anæmic or strumous persons, it does not seem to necessarily depend on any constitutional weakness or unhygienic surrounding, since it occurs in those who show no departure from ordinary health, and who have led a healthy out-door life. Women are decidedly more liable to the disease than men, and it occurs most frequently about puberty, or in early adult life. Young women servants seem specially liable to be affected.

Sir W. Dalby* speaks of dry catarrh as almost peculiar to children and young adults. He found many cases apparently causeless, but in a great many it followed measles, scarlet fever and whooping cough. In the early stage he considers it curable.

In children the atrophic condition is left after purulent catarrh of the nose; and in adults, the frequency with which the history can be obtained of purulent discharge in childhood seems to render it probable that this is the commencement of the disease in a large majority of cases.

Whether hypertrophy precedes the atrophy is a disputed point; in some cases it has been observed by authors; but probably atrophy is the earlier condition in the majority of cases.

The exact cause of the ozæna has yet to be decided;

* "Lancet," 1885, vol. i., p. 51.

decomposition of mucus, fermentation, and fatty degeneration of cells having all been suggested. Probably the discovery of Hajek of the bacillus fœtidus in the secretions of ozæna cases, which when cultivated gives rise to the characteristic odour, points to the true explanation of it. The stench is so peculiar that it can hardly be likened to any other, that given rise to by syphilis being quite distinct, though often more easily noticeable. The sense of smell is as a rule lost by the patient himself, but unfortunately the odour is so disagreeable to those around as frequently to affect the employment of the sufferer.

The objective conditions are excessive roominess of the interior of the nose, the mucous membrane appearing dry and thin, the turbinateds being small and hardly visible, with collections of crusts forming a lining to the nasal cavity. On separating the crusts, they are found to be covered with muco-purulent secretion, and the mucous membrane beneath them at first appears red, with possibly superficial excoriations, the membrane afterwards becoming pale. The posterior wall of the pharynx may be seen through the nose, and sometimes the orifices of the Eustachian tubes. The pharynx has a dry and glazed look, the dry condition extending in some cases to the larynx.

The most prominent feature in the nose is the loss of erectile tissue in the mucous membrane, resulting in thinning of all the soft structures; the turbinated bones themselves have also been found thinner, flatter and smaller*

* Zuckerkandl, "Normale und pathol. anatomie der Nasenhöhle." Wien, 1882.

than normal. When the inferior turbinated has atrophied the middle turbinated may appear as if hypertrophied, a larger extent of its surface being seen than in a normal nose.

Treatment.—Ozæna is unfortunately at present an incurable malady, though much may be done to relieve the condition. The most essential point is thoroughly cleansing the nose of the crusts and discharge. For this Condy's fluid in warm water may be syringed through the nose, but in many cases the crusts are so adherent as only to be removed by the aid of forceps.

After removal of the crusts the following spray may be used night and morning or more frequently if required :—

℞ Sodæ bicarb. gr. xv.
Boracis gr. xv.
Acid. carbol. gr. iv.
Glycerin. ♏ 45
Aq. ad ℥ j.
(*Throat Hosp. Pharm.*).

It may be sniffed through the nose, or used with a spray apparatus.

After removal of the secretions disinfecting powders may be introduced, as pure boracic acid, salicylic acid, or resorcin.

The treatment by Gottstein's method is founded on the fact that the ozæna is removed when the secretion becomes moist. It consists in the introduction of a plug of cotton-wool into the nose on one side at a time. This, by stimulating the mucous membrane, causes an increased flow of secretion which removes the fœtor. One nostril

may be treated in the day, the other at night. Constitutional treatment should also be adopted; cod-liver oil being administered if a strumous tendency exists.

Purulent Rhinitis of Children.—Though purulent catarrh of the nose is occasionally met with in adults, it deserves special attention from its much greater frequency as a disease of children.

There seems no doubt from cases on record, that acute purulent rhinitis is occasionally set up in newly-born infants from leucorrhœal discharge in the mother; and the disease may arise in adults also from gonorrhœal infection; but these cases are very exceptional. Probably in infants the disease arises from other irritants, such as soap accidentally getting into the nose, or exposure to cold acting on the delicate mucous membrane. There is, however, a disease met with in children at various ages, most frequently from three to five, which differs from this acute form in its tendency to last several years, and to go on to the atrophic form of rhinitis. In many cases it follows the exanthemata or occurs in those who show signs of struma; but in some no definite cause can be assigned, and it may be met with in children who look perfectly well. The disease is characterised by profuse discharge of yellow muco-purulent secretion which dries about the anterior nares.

The ozæna is usually very marked, making the near presence of the child unbearable to those around.

Examination of the interior of the nose is rarely possible, but the mucous membrane if seen is usually swollen and red.

In the cases met with by Bosworth* the ozæna was only present when the secretion had dried, as in atrophic rhinitis; but in some cases the fœtor may be observed while there is still a good deal of moist secretion.

The disease is very intractable, and tends as previously mentioned to progress to the atrophic condition. The patient may come under care many years afterwards, during adult life, for ordinary atrophic rhinitis and ozæna.

In making a diagnosis, the possibility of foreign body in the nose should not be forgotten; the purulent discharge is, however, in this instance on one side only.

Treatment.—The nose should be cleared of discharge with warm water, to which some Condy's fluid may be added. The parts having been cleansed, the following lotion may be sprayed into the nose.

℞ Sodæ bicarb. gr. xv.
Boracis gr. xv.
Acid. carbol. gr. iv.
Glycerin. ♏45
Aq. ad ℥j.

Cod-liver oil and tonics should be administered when indicated.

Blenorrhœa.—There is a peculiar malady, accompanied by ozæna, known as blenorrhœa of the respiratory mucous membrane, described by Stoerk. It is said to be common among the Polish Jews in Bessarabia, Gallicia, Poland, and South Russia.

The malady begins with a purulent discharge from the nose, and may gradually spread to the pharynx, larynx,

* "Diseases of the Nose," vol. i., p. 155.

and trachea, causing ulceration, followed by cicatricial contraction and stenosis. Tracheotomy has even been found necessary in exceptional instances.

Nasal Polypus.—By far the most frequent benign growths met with in the nose are mucous polypi. Their causation is obscure, they are occasionally met with coming on directly after a severe cold in the head; and they are not infrequently accompanied by hypertrophic rhinitis.

They usually occur in adults; but very large ones have been met with in children, though they are certainly uncommon.

They may be very numerous, as many as sixty-five having been removed from the nostrils of a patient by Schech. In fact they are generally multiple, and frequently bilateral. As a rule they are pear-shaped, being flattened by surrounding structures; occasionally one will be met with reaching the whole length of the nostril. The most frequent site for the attachment of the pedicle is probably the middle turbinated and the middle meatus; more rarely they are attached to the inferior turbinated, and very exceptionally to the septum.

They have a pale bluish jelly-like appearance, or when inflamed a deep red colour. Microscopically they are covered with ciliated epithelium like the mucous membrane from which they grow, and consist of a widely meshed network of areolar connective tissue.

The hard fibrous polypi are rare, and occur more frequently near the back of the nose, projecting into the post-nasal space. When one of these fibrous polypi has become inflamed and is commencing to ulcerate from

pressure of surrounding structures, it may give rise to the suspicion of malignancy. They have been removed the size of a pigeon's egg.

Small papillomata are not very infrequently met with upon the inferior turbinated, the mucous membrane having become hypertrophied and somewhat pedunculated at one point. Their colour and consistence vary.

Sarcomata occur very rarely in the nose.

The symptoms of mucous polypus are numerous, being chiefly those of chronic catarrh of the nose, with stuffiness and increased secretion, the most distressing being the sense of suffocation experienced by some patients when the polypi are obstructing both nostrils. The sense of smell may be impaired or altogether lost. The polypus may block the tear-duct or the opening of the antrum, and symptoms referable to these structures may be given rise to.

More important sometimes than these symptoms are certain nervous phenomena caused by nasal polypus. Of these, asthma or paroxysmal dyspnœa is perhaps the most frequent; but cough, attacks of giddiness, epilepsy and epileptiform seizures have all been recorded as excited by the growths, and cured by their removal.

Treatment.—Removal of nasal polypi by the wire snare, is far more satisfactory than by the older method of the forceps, both to the patient and operator. It is less painful, and allows of more accurate manipulation. The most convenient instrument for polypi in the front part of the nose is Mackenzie's cog-wheel snare, requiring only one hand to work it, while the other is left free for the

speculum. The wire should be adjusted as far up towards the pedicle as possible; and as the noose is shortened, the instrument should be pushed a little further into the nose so as not to draw it down the polypus again. Macdonald's modification of Jarvis's snare (*see* p. 16) is the most useful instrument for polypi in the post-nasal region; an anæs-

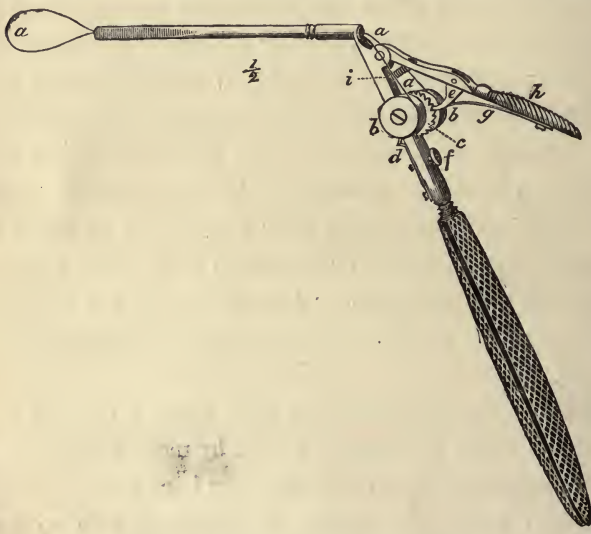

Fig. 6.—Mackenzie's Cog-wheel Snare.

thetic is advisable for these if possible, as the left fore-finger has to be placed into the post-nasal space to adjust the loop of wire, which is passed along the floor of the nose. There is more tendency to hæmorrhage from the firm fibrous polypi which occur at the back of the nose, and it is advisable to tighten the snare more slowly.

When polypi tend to recur it is necessary to destroy the site of attachment with some caustic, the galvano-cautery

or chromic acid being the most serviceable. This is best done at a short interval from the time of operation, as immediately after there is too much hæmorrhage to allow of accurate application. The galvano-cautery has been used entirely by some operators for removal of polypi, but the heat radiating off renders the operation more painful. Removal of a portion of bone has been recommended to prevent recurrence, and certainly does stop its occurrence; but it is probably not necessary if cauterization of the stump is effectually carried out, and a thick mucous discharge is apt to be left for a long time from the site of injury. Any hæmorrhage at the time of operation may be checked by syringing the nose with cold water. A boracic lotion (gr. x. ad ℥ j.) may be used to wash away discharge subsequent to the operation.

Diseases of the Septum.

Deflections.—These are one of the most frequent abnormalities in the nose; in fact a perfectly straight septum is the exception rather than the rule. Mackenzie found deviation of the bony septum in 77 per cent. of skulls examined by him. In some cases the cartilaginous portion has become bent, and presents on examining the interior of the nose a projection on one side and a depression on the other. In other cases the septum is thickened on one side, and presents no deflection on the other. The cause is in many cases probably a fall or blow on the nose in early life; the results of such injury being not infre-

quently seen in a recent state, the deformity being difficult to rectify. Partial thickening of the septum results in the formation of little spines or spurs which may contain cartilage, or cartilage and bone, in their interior.

Thickening of the floor of the nose may cause an impediment to the introduction of the Eustachian catheter, but may otherwise not have been noticed. When the deflection is only slight no inconvenience to respiration may result, but in some cases the nose may be completely obstructed on one side.

The observations of Zuckerkandl and Mackenzie go to show that deformity of the bony septum occurs most frequently in European skulls; the Aborigines of America, Africa, and the Polynesian Islands presenting the majority of symmetrical septa.

Treatment.—Surgical treatment is the only measure which will permanently remove the obstruction, but on account of the great sensitiveness of the region to operative treatment, it is best, unless the patient is suffering very decided inconvenience, to resort only to palliative measures.

Two milder measures, than removal of the deflected portion, which may be resorted to, are cauterization of the mucous membrane over the septum, or of that over the inferior turbinated. The galvano-cautery is the best instrument to use, and in either case care must be taken not to burn both at the same time, or adhesions may form between the two.

When it is decided to remove the projecting portion of septum, the mucous membrane is first cut through with a

small knife, the bone is then sawn level with the rest of the septum with a small saw; one devised by Bosworth for the purpose being the best. The chief difficulty encountered is to get the knife and saw far enough back; large deflections often extending some way into the nose. Spurs may sometimes be entirely removed with the knife; but they frequently contain some bone which has to be sawn. There is not infrequently a good deal of hæmorrhage after these operations, and as they are as a rule very painful cocaine should always be used.

Punching a hole in the septum seldom or never attains the object in view of relieving the obstructed side. None of the operations can be considered easy, or necessarily very satisfactory, and frequently it is best for the patient to put up with the inconvenience.

Perforation of the septum is met with due to syphilis, lupus, and also chronic rhinitis. The extensive, rapidly perforating, ulcer of syphilis, which frequently involves the vomer as well as the cartilage, is usually easily recognised. But occurring independently of syphilis is a slowly progressive ulcer situated just within the nostril. It begins first on one side; a small sore forms, the scab of which is picked off by the patient. After an interval of some time the other side begins in a like manner; and finally the two sores join, and a round perforation is left. This may very slowly get larger. Its active duration is months or years.*

Those engaged in the manufacture of chromic acid are liable to perforating ulcer of the septum. Fifty per cent.

* Hutchinson, "Medical Times and Gazette," July 5th, 1884.

of the workers are said to suffer from it. Workers in arsenic and cement are also occasionally affected.*

Necrosis of the cartilages of the nose is of course most frequently met with in tertiary syphilis; it may also occur as a sequela of typhoid.

Hæmatoma and abscess are very occasionally met with in the septum, chiefly as the result of injury.

Post-nasal Vegetations.—Excessive hypertrophy of the lymphoid tissue in the vault of the naso-pharynx results in the condition known as "adenoid" or "post-nasal vegetations."

These growths are very common, occurring chiefly in children, and being a frequent accompaniment of enlarged tonsils. Their causation is obscure; probably catarrhal conditions easily excite hypertrophy of this tissue in children, as well as in the case of the tonsils. Probably a moist climate assists in their production as they are met with less in the South of Europe than the North. They are frequently met with in several members of the same family. They have been found in a large proportion of cases of cleft palate.† Whether this is merely a coincidence from the frequency of the growths in question, or whether it is possibly due to exposure of this region in cleft palate to catarrhal influences is doubtful.

The growths seem to have a tendency to disappear about the commencement of adult age, as not a few cases may be met with in which remains of the growths may be seen with the mirror, and in which there was reason to

* Ball, "Diseases of the Nose."

† Mackenzie, "Diseases of Throat and Nose," vol. ii., p. 497.

suspect from the history that they were once more numerous; but of course a very few growths may cause a decided obstruction in this region in a child, proving unimportant as the post-nasal space enlarges later in life.

The most prominent symptoms given rise to by the affection are deafness, stoppage of the nose, and nasal catarrh. Of these deafness is the most important, as it tends to become permanent if the condition is not relieved, and may give rise to purulent catarrh of the middle ear,

FIG. 7.—Aspect of patient suffering from post-nasal vegetations, showing the mouth carried open from obstructed nasal respiration.

with perforation of the drums. The ear symptoms depend on the implication of the Eustachian tubes by pressure from the growths, and probably also from the catarrhal condition set up by them. The deafness may fluctuate, sometimes only being noticeable when the child has a cold. Examination of the drums usually shows the membranæ tympani depressed; perforation fortunately being much the rarer condition. The nasal obstruction, and with it the alteration of the voice, is what is usually noticed by

the parents. The child is said to breathe thickly and to snore badly at night. The aspect of the patient is very suspicious, being dull and stupid in expression, and the mouth is usually carried constantly open. The catarrh gives rise to extra secretion of mucus which may be seen hanging from the back of the pharynx.

The diagnosis is easily made with the finger in the post-nasal space, or by posterior rhinoscopy. The latter method is very rarely available in children and digital examination has to be resorted to. There is not infrequently slight hæmorrhage after touching the growths. The sensation of them has been not inaptly compared to a

Fig. 8.—Post-rhinoscopic view of post-nasal vegetations.

"bag of worms." They are soft, and easily displaced with the finger, though requiring a strong nail to detach them. When posterior rhinoscopy can be used the appearances are various; in some cases, though very few, the outline of separate growths can be indistinctly made out; but in the majority of patients a red mass which obscures everything, including most of the Eustachian tubes and septum, is all that can be seen. The pedicles of the growths are practically never seen, in fact their attachment is usually broad and shelves off into the surrounding mucous membrane.

The growth may consist of one solitary gland mass, hanging down from the roof of the pharynx and obscuring the posterior choana.

Microscopically these growths show a retiform network of connective tissue, filled with lymph corpuscles, thus nearly resembling the structure of the tonsils. On the surface they are covered with a layer of ciliated epithelium, like the mucous membrane, from which they grow; and they would thus seem to be a simple hypertrophy of normal structures. They are richly supplied with blood-vessels.

Treatment.—Removal under an anæsthetic with a pair of curved forceps (Löwenberg's perhaps being the

Fig. 9.—Löwenberg's Forceps.

best) is the most satisfactory treatment. The head should rest thrown back, with the mouth held widely open with a gag, the growths should then be seized with the forceps and either twisted off or their attachments separated with the left fore-finger, which is previously inserted as a guide. The hæmorrhage is somewhat profuse at the time of the operation, but ceases almost immediately after. The bleeding is probably increased by choosing ether as the anæsthetic instead of chloroform, but the greater safety of the former renders it the best anæsthetic to give. Care

should be taken in the operation not to strip the mucous membrane from the septum, or to include the Eustachian tubes in the grasp of the forceps. Small portions of growth left at the finish of the operation may be scraped with the finger nail. No instrument should be used sharp enough to punch pieces out of the mucous membrane, or subsequent hæmorrhage may ensue.

One ill-effect to be watched for after the operation is ear-ache. It probably results from blood getting into the Eustachian tubes, and requires gentle use of Politzer inflation, and the application of liquor epispasticus to the mastoid. Perforation of the membrane does unfortunately very occasionally result from it, but usually heals again quickly.

Post-nasal growths should be removed on much the same grounds as enlarged tonsils, that is whenever they are causing definite symptoms of either nasal obstruction or deafness.

Deafness due to Nose and Throat Disease.—Having just described the most definite form of throat affection which gives rise to deafness, it may be well here to mention other less definite lesions of the nose and throat which give rise to middle ear disease.

The **extension of nasal catarrh** to the Eustachian tubes is well recognized and is familiar to most persons in the temporary deafness which supervenes on a severe "cold" in the head. In these cases a sense of blocking of the ear is frequently experienced, and at each effort to blow the nose air may be forced into the tympanum. Cases of slowly progressive deafness not infrequently date

the commencement of their ear trouble to a severe cold, and state that the deafness was made worse at each successive attack of cold. Probably in some of these cases mucus gets forced into the middle ear by blowing the nose, and becomes inspissated, thus interfering with the free movement of the ossicles. Catarrhal conditions no doubt act chiefly in obstructing the Eustachian tube and preventing air having access to the tympanum. When Eustachian closure is present it is recognizable by the fact that the patient is unable to inflate the ear by Valsalva's method, or by the use of Politzer's inflation; and also by the depressed condition of the membrana tympani. The latter is seen to be retracted, with the long handle of the malleus in a more horizontal position than normal. On passing the Eustachian catheter and listening with the otoscope, moist bubbling sounds may sometimes be heard as the air enters the tympanum.

In some cases on the other hand the Eustachian tube may be too patent, and the patient may complain that he is always feeling them "click," with detriment to the hearing.

Nasal obstruction is also considered to cause deafness by preventing free access of air to the middle ear.

When the nose is completely obstructed, (as may be demonstrated by holding the end of the nose firmly) every act of swallowing exhausts the air in the tympanum. It is, however, of course unusual to get the nose completely obstructed by disease, and though it seems possible that partial stenosis may prevent such free entrance of air to the ear as normally should take place, yet it must be ad-

mitted that treatment of the nose is frequently unsatisfactory in giving any relief to the aural trouble.

Deafness seems to be an unusual accompaniment of atrophic rhinitis; though it does occasionally occur with that disease.

Post-nasal obstruction as a cause of deafness is most commonly seen in post-nasal vegetations, which have been previously discussed; besides this condition, hypertrophy of the posterior ends of the inferior turbinateds is occasionally seen giving rise to Eustachian obstruction and ear symptoms. These bodies are liable to become symmetrically swollen and to project so as to more or less completely close the orifice of the Eustachian tube. Tinnitus appears to be one of the symptoms which is occasionally due to the condition. The hypertrophy is diagnosed by post-rhinoscopic examination (*see* fig. 3, p. 13).

Hypertrophied tonsils may also cause more or less Eustachian obstruction; and in cases of quinsy, where the inflammation is chiefly peritonsillar, the patient is particularly liable to become temporarily deaf during the attack.

Treatment.—The treatment should be directed to removing the conditions giving rise to the Eustachian closure, by the methods which have been referred to under their separate headings. The Eustachian tubes may be opened by directing the patient to practice Valsalvan inflation, by the use of Politzer's method, or by the Eustachian catheter.

For removing mucus from the neighbourhood of the

Eustachian tubes an alkaline lotion may be used for the nose. (For formula *see* p. 11). This may be sniffed or sprayed through the nose, so as to run into the throat.

Diseases of the Antrum.—The antrum as an accessory cavity of the nose requires consideration in the study of nasal diseases, although it perhaps more frequently comes in the domain of dental surgery. Its chief affections are acute and chronic inflammation.

Acute inflammation may arise from extension of disease from the first and second molars, or from inflammation of the adjoining nasal cavity. The symptoms are throbbing pain with great general swelling of the cheek, accompanied by more or less feverishness. An erysipelatous blush may show itself on the cheek as the disease progresses.

Chronic inflammation or empyema may be caused in a similar way as the acute disease, *i.e.*, extension of inflammation from the nose, or dental disease. The latter is probably the most common cause. The affections of the nose which may cause blocking of the opening of the antrum, and so lead to distension, are hypertrophied turbinateds and nasal polypus.

Traumatism is also a possible cause, as in blows on the face or injury in extraction of teeth.

The symptoms are pain referable to the cheek, and a sense of fulness and weight below the orbit. The pain is often of a neuralgic character and may be referred to the teeth. There is discharge of fœtid pus from the nostril of the side affected, which is periodic in character, with intervals when distension takes place. The fœtid odour

is unlike ozæna in being noticed by the patient, and not usually by those around.

A pus discharge from one nostril, coming on when the patient leans the head forward, should always excite suspicion. The only other causes which might give rise to it are foreign bodies, rhinoliths, and new growths. The intermittent character of the discharge is the most characteristic point. Examination should be made with a speculum, cocaine being also used, the pus will be found making its exit below the middle turbinated.

The treatment is essentially dental, and as a rule, the assistance of the dental surgeon will be required. The first point is to remove any possible exciting cause which can be found, such as carious teeth, &c.; and any polypi in the nose should be removed. Free drainage and irrigation of the cavity with antiseptics are the next most essential measures. When a tooth has to be extracted, the antrum may be tapped through the alveolus; the first and second molars and the second bicuspid being the teeth in closest proximity to the floor of the antrum. When the alveolus of a molar is chosen, the opening should be made through the buccal rather than the palatine root, as the latter leads more in the direction of the floor of the nose. When it is not desirable to extract a tooth the opening should be made in the middle of the alveolar ridge. The mucous membrane having been first incised down to the bone, a gimlet-drill is used to perforate. Care must be taken in using any instrument not to push it too far in, and so penetrate the floor of the orbit. The opening having been made the cavity should

be washed out with a fine Eustachian catheter or small nozzle, to which is attached a syringe worked by an elastic ball action, and capable of throwing in a continuous stream. The head should be inclined forwards, and the lotion will make its exit through the nose. A solution of perchloride of mercury 1-2000, or carbolic acid 1-50, or permanganate of potash may be used. The opening should be kept patent by inserting a drainage tube. For this a piece of Ellis's drainage tube about an inch in length is useful; it should be untwisted at the end to prevent its slipping too far into the cavity. A dental plate may be devised to hold the tube in position. The patient may soon be instructed how to carry out the irrigation himself.

Syphilis of the nose usually occurs as a tertiary manifestation three or more years after contagion. The ulceration may be acute or chronic. In the acute cases it may rapidly destroy the septum and cause great deformity in a few weeks. To prevent this the treatment must be very prompt. The nasal passages must be cleansed, and acid nitrate of mercury freely applied to the ulcerated parts. Iodide of potassium should be given internally, and iodoform dusted over the surface.

A similar form, but not usually so rapid, is met with in the inherited disease both in adults and in children.* It requires the same prompt treatment to prevent deformity. Nasal coryza is of course one of the earliest manifestations of the taint in infancy, giving rise to snuffles.

* Hutchinson, "Syphilis," p. 157.

SECTION II.

Diseases of the Pharynx.

The Anatomy of the Pharynx.—The mucous membrane of the pharynx is continuous with that lining the adjacent cavites. It varies somewhat in character at different parts, being thick where it adheres to the base of the skull, and thinner near the entrance of the Eustachian tubes, and posterior nares; in this situation numerous racemose mucous glands are collected beneath the mucous membrane. Lymphoid follicles are also found throughout the whole of the pharynx. A collection of these, similar to those forming the tonsils, stretch across the back of the pharyngeal cavity between the Eustachian tubes. The epithelium upon the upper part of the pharynx as low as the level of the floor of the nares is columnar and ciliated; below that point it is squamous and destitute of cilia.

The muscles of the pharynx are the superior, middle, and inferior constrictors, the stylo-pharyngeus, and the palato-pharyngeus.

Foreign Bodies.—Small fish-bones are the most frequent foreign bodies found in the pharynx, their most usual site of lodgment being in the posterior pillar of the fauces. Tooth brush bristles, ears of corn, false teeth, &c. may also effect lodgment. Fish bones may easily penetrate deeply, and project so little as hardly to be visible.

They give rise to sharp pricking pain at each attempt at deglutition, and cause abrasion of the mucous membrane when dislodged, giving rise to sensations of irritation after they are no longer in the pharynx. Secondary inflammation, abscess, and hæmorrhage, have been known to follow in exceptional cases. Having ascertained the probable nature and size of the foreign body, a careful examination must be made by inspection with a good light, and if necessary by palpation with the finger. Their removal is usually easily effected with forceps, a pair of dressing or laryngeal forceps being the most convenient. In the larger proportion of cases the foreign body has been swallowed, and it is the erosion which is giving rise to the symptoms.

Concretions may form in the crypts of the tonsils and give rise to the symptoms of foreign body. They are met with as tonsil stones from the precipitation of lime into the exudation of follicular tonsillitis. Amputation of the tonsil with the lacunæ is the most effectual treatment; or the bridges of mucous membrane over the orifice may be divided, and the interior of the crypt cauterized with some caustic in order to excite adhesions.

Acute Tonsillitis.—Acute inflammation of the tonsils may occur at any age, but is most frequently met with in young adults. The affection is met with in greatest numbers about spring and autumn; any considerable change in the weather from cold to hot, or the reverse, being likely to cause outbreaks of it. Scarlet fever, diphtheria, and rheumatism, may give rise to the disease. Residence in hospitals not infrequently gives rise to in-

flammation of the pharynx and tonsils, known as "hospital sore throat." Exposure to sewer gas may also act as a cause. The most prominent symptoms are pain in swallowing, soreness, difficulty in opening the jaws, pain shooting to the ears, with general febrile symptoms and high temperature. The latter may be raised to 104° F. or more.

Examination usually shows one or both tonsils swollen up and reddened, with yellowish spots over the surface. The inflammation may involve the tonsil chiefly or the surrounding tissues. The uvula may be œdematous, and the glands in the neck enlarged. The tongue is usually covered with white fur. Dryness of mucous membrane may be present at first, but subsequently frothy mucus is secreted profusely. If suppuration takes place, it may be detected by the pointing of the abscess at one spot; but usually its existence has to be inferred by the duration, and extreme tension of the swelling. In the follicular variety the follicles become very active, and cover the tonsil with white or yellowish secretion. The voice becomes thick and toneless and is very characteristic. The malady usually runs its course in from a week to ten days.

Some patients are subject to very frequent recurrence of tonsillitis.

Treatment.—Guaiacum and quinine have both been recommended as more or less of specifics in tonsillitis, and if given early enough they will occasionally cut short an attack, but as a rule the disease runs its own course. Either warmth in the form of steaming the throat, or the opposite, cold by the use of ice, give relief. Spraying

with cocaine gives temporary relief for swallowing; its use is, however, to be avoided in children. When there is much tension or indication of the formation of pus, scarification with a bistoury may be resorted to. When a patient is subject to very frequent tonsillitis, and the tonsils are enlarged, it is best to remove them. It is not, however, possible to prevent future attacks altogether by this method, as the portion of the tonsil left is still liable to inflame. Painting the tonsils with strong iron solution (120 gr. of ferr. perchlor. to ʒj.) combined with constitutional measures tends to prevent their liability to inflame.

An aperient is usually required in the acute stage; one of the best being the following:

℞ Ferri sulph. gr. ij.
Mag. sulph. gr. xxx.
Acid. sulph. dil. ♏v.
Aq. menth. pip. ad ʒj.
Misce.

Acute Pharyngitis.—The pharynx may share in the inflammation of the tonsils or may inflame independently. It is most frequently of catarrhal origin, but it may be symptomatic of measles, typhoid, small-pox, and syphilis. A slight "sore throat" may also be the only manifestation of an attack of scarlet fever, and is usually accompanied by swelling of the glands under the jaw. A slight pharyngitis also, hardly noticed by the patient, may be followed at the end of three to six weeks by diphtheritic paralysis; thus indicating only subsequently its specific nature. The condition gives rise to soreness, heat and

dryness in the throat, and usually passes away without giving rise to the great dysphagia experienced in quinsy. Congestion of the posterior wall of the pharynx is seen on examination; and the uvula may be pendulous, and irritate the back of the tongue.

Treatment.—Benzoin inhalation, and possibly an aperient mixture are all that are required as a rule, the attack passing off in a few days. Painting the pharynx with astringents (perchloride of iron ʒ ij. to ℥ j.) is useful when the uvula is relaxed.

Chronic Tonsillitis.—As a result of frequent attacks of acute tonsillitis, or apparently independently of such inflammation the tonsils may become enlarged. All the structures become thickened in the tonsil, and they may be so large as to meet in the middle line. The surface of the tonsil may be smooth, or indented with follicles which secrete a cheesy matter, which occasionally becomes calcareous. The affection is most common in children, tending to run in families; and frequently accompanied by post-nasal vegetations.

They chiefly cause inconvenience from their size in obstructing respiration, and in this way frequently interfere materially with the health of the child, causing anæmia, &c.; in exceptional instances pigeon-breast has been known to result. When crypts are present food is apt to lodge in them and undergo decomposition, and not infrequently the glands in the neck enlarge, owing apparently to the irritation set up in the tonsils. Masses of actinomyces have been found in the crypts of the tonsils.

It is possible that deafness may result from hypertrophied tonsils solely; but as a rule it is due to the accompanying post-nasal vegetations.

Rheumatic Tonsillitis. — A somewhat peculiar variety of tonsillitis occurs in conjunction with rheumatism. It differs from the ordinary form in that the tonsils present a more red glairy appearance and are chronically painful. There is no great enlargement, and the pain is the most prominent symptom.

Treatment.—Astringents have little or no effect in

FIG. 9.—Mackenzie's Tonsillotome.

reducing enlarged tonsils, and removal is the only effectual measure. There seems no reason against removing them in children in all cases where their size is causing any inconvenience. For this purpose Mackenzie's tonsillotome is the most convenient instrument to use, and the one with the smallest aperture that will go over the tonsil should be chosen. This prevents the tonsil slipping out as the blade is driven home. If possible one assistant should hold the child's hands and another steady the head, at the same time pressing in the tonsils from the outside

of the neck. No spatula is needed as the arm of the instrument depresses the tongue.

In adults tonsillotomy unless definitely indicated is to be avoided on account of the greater risk of hæmorrhage. If, however, the patient is suffering from frequent quinsies, or considerable obstruction to respiration and swallowing, they are better removed. Hæmorrhage is best arrested by rinsing the mouth with cold water at the time, and if any occurs subsequently, by sucking ice; or if troublesome, by rubbing into the tonsil a mixture of tannic and gallic acid, made into a thick paste by the addition of a very small quantity of water. For children a small dose of perchloride of iron may be given from the first after the operation.

When a crypt is causing inconvenience from food lodging in it, its interior may be cauterised with nitrate of silver (fused on a probe) or with the galvano-cautery. If the tonsil projects much, it is best to remove it. Removal of the tonsil with a wire snare or the galvano-cautery wire, is occasionally performed, but is a tedious method for the patient; the risk of hæmorrhage is probably less. It should be remembered that removal of the tonsils in a singer may alter the tone of the voice.

Chronic pharyngitis is a common affection, and occurs from a variety of exciting causes, such as colds, overuse of the voice, or working in irritating atmosphere, &c. That overstrain of the voice acts as a cause, is shown in its prevalence among clergymen, actors, singers, hawkers and teachers. It is the use of the voice in a constrained and unnatural way, or in an unsuitable atmo-

sphere, that gives rise to the condition to a great extent. The pharynx suffers also in nearly all nasal affections which interfere with respiration. It is, however, essential to remember that the pharynx is also part of the alimentary canal as well as of the air tract, and probably disorders of digestion cause more symptoms of pharyngitis than any other cause. The use of alcohol and particularly of spirits acts in this way as an important factor in causation.

The subjects of chronic pharyngitis are frequently very hypochondriacal and over-sensitive, being quite unable to forget their trouble for a moment. Women also at the change of life frequently complain of subjective sensations in the pharynx.

The symptoms complained of are chiefly sensations of dryness, itching, or burning of the throat, with desire to clear it of viscid mucus by hawking; the voice also soon becomes tired, and occasionally a pricking pain will commence at one spot, rendering the voice useless for the time. Cough may also occasionally be present. If the nose or larynx are affected at the same time, or if the pharyngeal symptoms are due to indigestion the symptoms are of course modified. When those who use the voice professionally complain that it has lost its resonance or easily tires, it is sometimes difficult to locate the vocal weakness to either the pharynx or larynx from any structural change in either; probably in a large majority of cases both are at fault. Rigidity, dryness, or hypertrophy of the tissues of the pharyngeal wall, probably all assist in causing deficient tone in the voice.

On examination the most frequent condition seen is that of small red masses dotted over the posterior wall of the pharynx (granular pharyngitis). These vary in size, sometimes being quite distinct and occasionally coalescing in small ridges. How much these granulations serve as factors in the case is often difficult to decide. In children they are frequently present, and seem to be a normal condition; and in many adults they may be present to a marked degree without causing symptoms. Probably it is when they have become inflamed with the rest of the mucous membrane that they give rise to inconvenience. Occasionally an exudative form of pharyngitis is seen in which the follicles secrete a viscid white secretion, similar in appearance to follicular tonsillitis. The lateral portions of the pharynx may hypertrophy in the form of two reddened swellings behind the posterior pillars of the tonsils. The uvula may become relaxed and irritate the back of the tongue, being swallowed on deglutition. The term "relaxed throat" is perhaps most applicable to this condition; it is usually left after a severe cold.

Clergyman's sore throat is usually considered synonymous with granular pharyngitis, but probably both larynx and pharynx share in causing the vocal weakness in the majority of cases.

Treatment.—The cure of chronic pharyngitis is often very tedious and requires much patience. Astringents applied with a brush such as the perchloride of iron (℥ ij. of the salt to ℥ j. water), nitrate of silver (gr. 60 to ℥ j.), or chloride of zinc (gr. 30 to ℥ j.), combined with tonics, are perhaps the most useful. If the granulations are in-

Rest for severe cases

flamed they may be cauterized with the galvano-cautery, the acid nitrate of mercury (each granulation being carefully touched with a glass brush), or a saturated solution of chromic acid (applied on a bare probe). The destruction of the follicles is essential in the exudative form. The destruction of granulations in granular pharyngitis, though it frequently gives marked relief for a time, is unfortunately often subsequently disappointing.

The gentian and soda mixture with nux vomica is the most useful for the dyspeptic form. Alcohol should be prohibited, unless some such wine as claret is allowed for the general health. Excessive smoking is to be avoided, but in moderation does no harm; probably nicotine affects the pharynx chiefly through the stomach. Lozenges, such as krameria, borax, marsh-mallow, and cocaine, used before speaking, may assist the voice in professionals.

Uvulotomy is an operation very rarely required for the relaxed pharynx, astringents being usually sufficient to give tone to the pendulous uvula. If it, however, remains long, in spite of treatment, the tip may be removed. The best instrument for this is Macdonald's uvulotome, which consists of a pair of curved scissors fitted above a pair of forceps, enabling the operator to keep one hand free for the tongue spatula. Another method is to catch the tip of the uvula with a pair of toothed forceps, and remove with curved scissors. Pain on deglutition is usually bad for a week, and cocaine may be applied before swallowing.

Gouty pharyngitis appears to resemble very much the rheumatic throat. The pillars of the fauces, the velum, and the uvula become very red and glazed over,

"as if freshly painted with glycerine."* The uvula is greatly enlarged, and the pharynx has red glairy prominences upon it, with depressions here and there covered with greyish slightly adherent patches of mucus.

"Angina tonsillaris, very painful, but not suppurating, may in the gouty suddenly yield to an acute articular attack."†

Pharyngitis Sicca.—This term has been applied to cases in which the posterior pharynx is seen to be dry. The proof of it being a pharyngitis, or in any way connected with inflammation of mucous membrane is usually wanting, and the term is therefore to be regretted. The pharynx is, however, when dry, almost always irritable and uncomfortable. It is nearly always an accompaniment of some nasal disease, dry atrophic rhinitis being the most frequent cause. Obstruction of the middle meatus may also produce a dry pharynx (Macdonald).‡ There is usually no hypertrophy of glandular structures, but the mucous membrane appears thin and is glazed by dry secretion.

Herpes of Pharynx.—Herpetic eruptions on the mouth and pharynx are occasionally met with, and may give some of the appearances of syphilitic disease. They occur perhaps more frequently in those who have had syphilis, and probably have some connection with it in these cases;§ though they certainly occur independently of that disease.

* Sir Dyce Duckworth, "A Treatise on Gout," p. 88.

† Ibid. ‡ "Nasal Obstruction," p. 15.

§ Hutchinson's "Archives of Surgery," vol. i., p. 173.

The onset is ushered in by feverishness and tendency to rigor. Vesicles then form on the tonsils and soft palate, subsequently covering these parts with small ulcers arranged in groups, surrounded with a bright red areola. The disease is usually limited to one side, but may be symmetrical. Arsenic is the best remedy to prevent recurrence.

Syphilis of the Pharynx.—Symmetrical kidney-shaped ulcers having the appearance of snail tracks on the tonsils are the most characteristic manifestation of syphilis in the secondary stage. These greyish-white patches may be on any part of the mouth, and are frequently seen behind the last molar tooth. When the uvula is symmetrically notched at its base suspicion should be aroused. The appearance of mucus patches is quite diagnostic; the application of nitrate of silver gives a similar appearance, but is of course easily excluded.

In diphtheritic patches, the membrane is thicker and more opaque.

Transitory congestion and soreness may, however, be the only secondary manifestation in the pharynx.

Relapses of ulceration may occur in some patients, and abrasions form, covered with yellow secretion, which are difficult to cure by treatment. Mercury in exceptional cases seems only to aggravate.

Treatment.—Prolonged administration of small doses of mercury; and washing the mouth with perchloride of mercury gargle is the best treatment for the secondary stage. If the ulcers prove very intractable, touching them with the acid nitrate of mercury does good.

Tertiary ulceration may show itself at any part of the pharynx, eating deeply into the tissues, and rapidly perforating palate or pharynx unless arrested by treatment. The ulcers have a congested raised margin and extend at their edges as well as deeply. Superficial slowly spreading ulceration, having a "worm-eaten" appearance, and presenting much the characters of lupus, is also seen, as a tertiary phenomenon.

Rapidly destructive ulceration of the pharynx is also seen in the inherited disease and may be the only manifestation of that taint, the typical teeth, &c., being not infrequently absent. It may cause perforations of the soft palate, or may destroy the whole of the uvula; subsequently leaving the posterior pharyngeal wall in a condition of scar.

Treatment.—The application of the acid nitrate of mercury is the most efficient treatment in stopping the ulceration; combined with the internal administration of specifics. The tissues rarely break down after once soundly healing. The acid nitrate should be applied with a glass brush, blotting paper being used to remove any excess of acid.

Diphtheria.—The usual manifestations of this specific disease in the pharynx are first the appearance of redness and tumefaction of the tonsils, pillars of fauces and soft palate, &c. Soon after greyish opaque buff-coloured patches show themselves on some part of the congested area. These adhere more or less closely to the subjacent tissues, which are left excoriated and bleed slightly after their removal. These patches tend to spread rapidly and

coalesce, and may soon cover the whole pharynx, including the uvula. The latter may become œdematous and the tonsils enlarged. The glands in the neck also nearly always become swollen and tender, even in the milder cases. The membrane may now tend to spread towards the larynx or nose; or in the course of a few days may separate, and the patient become convalescent. Very various degrees of severity are seen from slight soreness of the throat, hardly noticed by the patient, to the most malignant type of the disease. There is rarely that great discomfort in swallowing which is experienced in acute tonsillitis. Patients have been known to have the disease several times.

There is a form of follicular tonsillitis, in which the follicles exude a white secretion, which becomes adherent to the tonsil and may give the appearance of membrane; it is, however, more easily separated from the subjacent surface than the diphtheritic membrane, and does not leave the mucous membrane excoriated. The grey patches which occur on the fauces in syphilis are less dense and opaque than those of diphtheria; besides the duration and history serving easily to differentiate.

Treatment.—For the local treatment of diphtheria various remedies have been recommended. The application of undilute hydrochloric acid, nitrate of silver, and bicarbonate of soda have been used. Chlorate of potash gargle and the sucking of ice are useful. Emetics may be used to separate the membrane from the larynx by the act of vomiting.

The disease being a very lowering one, steel and quinine, and nutritious diet are most important.

For cases where the membrane has extended to the larynx intubation has of late largely been adopted instead of tracheotomy. It has the advantage that it may be

FIG. 11.—O'Dwyer's Intubation Tubes, showing gag, pilot and tube, and forceps for extraction of the latter.

performed in cases when the parents will not consent to the cutting operation. The tube is inserted on a pilot with the left forefinger as a guide to its introduction.

One of the chief subsequent difficulties is the swallowing of liquids, and solids or semi-solids are the easiest for the child to take while the tube is in position.

Diphtheritic Paralysis.—This sequel of diphtheria comes on from varying periods of a week to six weeks after convalescence, but in very exceptional instances has been known to appear at the time of separation of the membrane. The paralysis may be confined to the palate or may extend to the larynx; in the latter it may be sensory or motor; much the most frequent being that of the superior laryngeal nerve.

The patient acquires a nasal twang in his voice, and finds that fluids come back through the nose. The paralysis is not attended by any sign of inflammation; the soft palate being seen to hang down and not to respond to mechanical irritation. With paralysis of the soft palate may be associated that of the stapedius muscle, and the patient may complain of want of co-ordination for sounds, and tinnitus. The paralysis in fact is limited to no special part of the body.

The primary diphtheritic sore throat may have been exceedingly slight, hardly remembered by the patient. The condition is rarely fatal, though such result may take place from inability to swallow, or from food getting into the larynx. Recovery usually takes place at the end of two to three months.

Treatment.—Tonics, especially iron and nux vomica, should be given; combined with liberal diet and stimulants.

Post-pharyngeal Abscess.—Suppuration behind the pharynx occurs chiefly in young weakly children par-

ticularly those at the breast, but is also met with in adults. The suppuration may arise from diseased bone, struma, scarlet fever, or without definite cause being ascertainable. It shows itself as a smooth red projection of the mucous membrane of the pharynx, rounded in contour, and soft and fluctuating to the touch. The swelling may be situated in the posterior wall of the pharynx, or near the posterior pillar of the tonsil, simulating at first glance enlargement of that gland. The symptoms given rise to are mainly impeded respiration and deglutition. The dyspnœa may become croupy in character. The insidious onset would distinguish it from croup in cases too low down to be examined.

Fatty tumour at the back of the pharynx has been mistaken for post-pharyngeal abscess.*

Post-œsophageal abscess has also given rise to the suspicion of the presence of laryngeal growths.

Treatment.—The abscess should be freely opened with a bistoury, and the mouth sprayed or gargled with some antiseptic solution. Borax in glycerine makes a good application, as it adheres longer than watery solutions; it may be applied with a brush. Care should be taken in opening the abscess that the pus does not get into the larynx; the child's head should be thrown forward. The abscess may fill again from the wound closing; to prevent which the edges of the latter may be touched with some caustic; or the cautery. Tonics should also be given. The prognosis is usually favourable.

Malignant Disease of Pharynx.—Both epithe-

* "Lancet," 1876, vol. ii., p. 685.

lioma and sarcoma attack the tonsils and pharyngeal wall, and present the same characters as those growths elsewhere.

Epithelioma is to be recognised by the new growth and ulceration, and causes pain shooting to the ears, and dysphagia. The only other disease likely to simulate it is syphilis, in which the raised inflamed border of an ulcer may give rise to the suspicion of new growth. Iodides serve to differentiate between the two.

Sarcoma of the tonsil has been known to extend over many years, and to be very slow in recurring after removal. It presents the appearance of a smooth enlarged tonsil, and is to be recognized by its large size, firmness, and steady increase.

Ulceration into the carotid may lead to the fatal termination.

Treatment.—It is rarely possible to efficiently remove epithelioma of the pharynx, on account of the proximity of the vessels of the neck. If seen early, destruction with acid nitrate of mercury is probably the best. Sarcoma may be partially removed; the most convenient methods being to snare the growth with the cold wire (Jarvis' snare), or to burn it off with the cautery. The tumour may be first transfixed with a needle on a holder to pull as much of the growth into the snare as possible. The tightening of the snare should be performed slowly to avoid hæmorrhage. Considerable relief to the swallowing may be obtained after removal of only a portion of the growth. Arsenic or iodides to delay new growth may be given when operation is impracticable.

Tubercle of the Pharynx.—Minute grey granulations may be occasionally found on the palate and pharynx in cases of tuberculosis. They resemble in all characters grey tubercles occurring elsewhere. They tend to form ulcers, which coalesce into larger areas of shallow ulceration. They are of indolent and intractable nature, though not tending as a rule to extend deeply into the mucous membrane, or to cause perforation of the palate.

Usually the disease of the pharynx shows itself later on in cases of tuberculosis, after the lungs and larynx have been involved; more rarely they are seen before other marked physical signs are to be found elsewhere.

There is usually severe pain on attempting to swallow, and constant soreness.

The ulceration is distinguished from syphilis by the general signs of phthisis in the patient, by the ulceration not extending so deep and being more intractable than that of syphilis. Tubercle bacilli may also be found. Tubercle may, however, occur in a mouth which has already been the site of tertiary syphilitic ulceration, and the appearances may be modified by the two diseases.

Lupus of Pharynx.—Lupus of the pharynx and palate may occur, either secondary to external lupus or primarily on the mucous membrane; subsequent to disease on the skin being the more common form. The disease is seen in children of a strumous type, and may occur from acquired struma after one of the exanthems. When associated with the cutaneous disease it may be directly continuous with the latter, or in an independent patch.

The mucous membrane becomes first red and somewhat

œdematous, then finely granular; and later shallow ulcerations appear, which coalesce into irregular margined areas. If healed by treatment the ulcers leave scars, which by cicatricial contraction may result in great narrowing of the pharynx, so as to leave only a small aperture for the food to pass through. The disease is essentially chronic and lasts many years. As the ulceration spreads the uvula and soft palate become destroyed. The ulceration has a general "worm-eaten appearance," the margins being congested, with small red granulations dotted over the ulcerated area. The disease may spread into the nose, or involve the larynx; not infrequently the gums become spongy in appearance, and may share in the ulceration. The patient may be liable to attacks of acute inflammation in the throat, which may temporarily alter the appearance of the original disease. Lupus of the soft palate does not tend to cause perforations, though considerable extent of tissue may be destroyed; nor does it lead to necrosis of bone either there or in the nose; factors in diagnosis between the disease in question and syphilis.

The tubercle bacilli are more sparingly distributed in lupus than in miliary tuberculosis, and are thus less easily made use of for diagnosis.

Treatment.—The pain and soreness experienced by the patient in tubercular ulceration are best relieved by insufflations of morphia (gr. $\frac{1}{8}$-$\frac{1}{4}$, with gr. $\frac{1}{2}$ of starch). Cocaine may also be used. Lactic acid (10 per cent. to 60 per cent.) has recently been strongly recommended for healing tubercular ulceration of mucous membrane.

For lupus cauterization of the patches so as to destroy

the growth is the most essential point. The acid nitrate of mercury is the most efficient for this, applied cautiously with a glass brush. The Paquelin cautery may also be used.

Constitutional treatment, cod-liver oil, tonics, and sea or country air, the latter often suiting best for lupus, should also be adopted.

Arsenic and small doses of mercury will assist in delaying lupoid growth.

SECTION III.

Diseases of the Larynx.

Anatomy of the Larynx.—The most important points in the anatomy of the larynx, which have special bearing on the study of its diseases will here be alluded to, not attempting to enter fully into the details of its structure.

As regards the structure of the **cartilages** of the larynx, it may be remembered that the epiglottis, the cartilages of Santorini, and the cartilages of Wrisberg, are composed of yellow or elastic fibro-cartilage, and have little tendency to ossify. The structure of all the other cartilages of the larynx resembles generally that of the costal cartilages; like which they are very prone to ossify as life advances.

The inferior **thyro-arytenoid ligaments** are prolongations upwards of the crico-thyroid membrane, attached in front to the middle of the angle between the alæ of the thyroid cartilage, and behind to the anterior projection of the base of the arytenoid cartilages; their upper edges are free and form the true vocal cords.

The **crico-thyroid** and **crico-arytenoid joints** have each a ligamentous capsule and synovial membrane like other joints.

On examination of the larynx during life, there are seen on each side at the posterior part of the upper aperture, two rounded elevations, corresponding respectively from without inwards to the cartilages of Wrisberg and San-

torini. In the middle line, in front, there is a tumescence of mucous membrane at the lower part of the epiglottis, named the cushion or tubercle of the epiglottis. The mucous membrane between the arytenoid cartilages is stretched when they are separated, and folded double when they are approximated.

Bounded by the superior and inferior vocal cords are two deep oval depressions, one on each side of the glottis, named the **sinuses** or **ventricles** of the larynx, and leading upwards from the anterior parts of these depressions, external to the superior vocal cords are two small culs-de-sac, named the **laryngeal pouches** or **sacculi.**

The **superior** or **false vocal cords,** so named because they are not immediately concerned in the production of the voice, form on each side a free crescentic margin, bounding the corresponding ventricle of the larynx.

The **inferior** or **true vocal cords,** the structures by the vibration of which the sounds of the voice are produced, bound the two anterior thirds of the aperture of the glottis. The mucous membrane covering them is so thin and closely adherent as to show the yellowish colour of the ligaments through it. Their free edges which are sharp and straight and directed upwards, form the lower boundaries of the ventricles, and are the parts thrown into vibration during the production of the voice. Their inner surfaces are flattened and look towards each other.

The **rima glottidis** is an elongated aperture situated anteriorly between the true vocal cords, and posteriorly between the bases of the arytenoid cartilages, forming a

long narrow slit, slightly wider in the centre when nearly closed, as in the production of the voice; when moderately dilated, as in easy respiration, its shape is that of a long triangle; while in its fully dilated condition it is lozenge-shaped (the posterior sides being formed by the inner sides of the bases of the arytenoid cartilages).

The **ventricles** or **sinuses** of the larynx are narrower at their orifice than in their interior. The outer surface of each is covered by the upper fibres of the corresponding thyro-arytenoid muscle. The two small *culs-de-sac* named the **laryngeal pouches** lead from the anterior part of the ventricles upwards for the space of half an inch, between the superior vocal cords in the inside, and the thyroid cartilage on the outside, reaching as high as the upper border of that cartilage at the side of the epiglottis. There are numerous glands opening into its interior, and it is surrounded with fat. A thin layer of muscular fibres form a compressor for it, on its laryngeal side and upper end.

Muscles of the Larynx.—The intrinsic muscles of the larynx are the *crico-thyroid*, the *posterior* and *lateral crico-arytenoid*, the *thyro-arytenoid*, the *arytenoid*, and the *aryteno-epiglottidean*. All these muscles are arranged in pairs, except the arytenoid, which crosses the middle line.

The **crico-thyroid muscle** is a short thick triangular muscle seen on the front of the larynx. It arises from the cricoid cartilages, passes upwards and outwards, and is inserted into the inferior border of the thyroid cartilage and into the anterior border of its lower cornua. Its

action is to produce elevation of the front of the cricoid, and backward movement of the arytenoid cartilages.

The **posterior crico-arytenoid muscle,** arising from the corresponding half of the posterior surface of the cricoid cartilage, passes upwards and outwards to be inserted into the outer angle of the base of the arytenoid

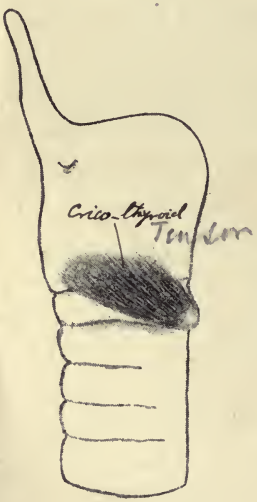

FIG. 12.
The crico-thyroid muscle.

FIG. 13.—The posterior crico-arytenoid and arytenoideus muscles.

cartilage. Its action is to pull backwards the outer angle of the arytenoid cartilages, and thus draw asunder the posterior extremities of the vocal cords, dilating the glottis to its full extent.

The **lateral crico-arytenoid muscle** is in great measure hidden by the ala of the thyroid cartilage. It

arises from the upper border of the side of the cricoid cartilage, and passing backwards and upwards is inserted into the outer side of the base of the arytenoid cartilage, and to the adjacent part of its anterior surface. Its action is to pull forwards the outer angles of the arytenoid cartilages, and so approximate the cords to the middle line.

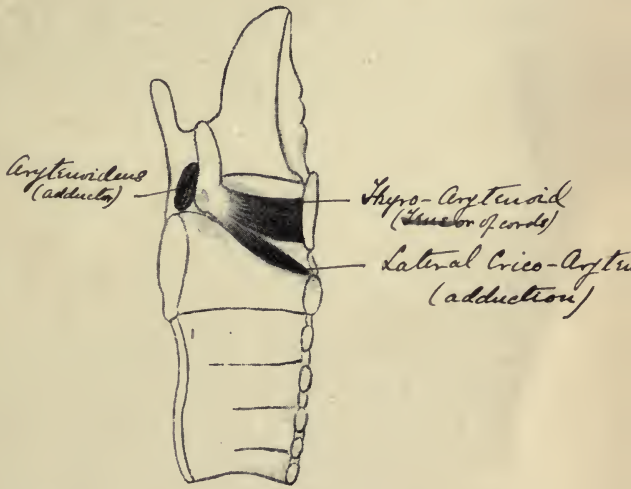

FIG. 14.—Section of Larynx, showing the thyro-arytenoid and lateral crico-arytenoid muscles; the arytenoideus is also seen in section.

The **thyro-arytenoid muscle** is situated above the lateral crico-arytenoid. It consists of several distinct fasciculi, which arise in front from the internal surface of thyroid cartilage, the lower two-thirds, close to the angle formed by the junction of the two alæ, and extend almost horizontally backwards and outwards to reach the base of the arytenoid cartilage.

The lower portion, which forms a thick fasciculus, is inserted into the anterior projection on the base of the arytenoid cartilage and the adjacent surface, close to the lateral crico-arytenoid. The upper thin portion is inserted higher up on the anterior surface and outer border of the arytenoid cartilage. The lower portion contributes to the support of the true vocal cord, lying parallel with it. The upper thin portion lies upon the laryngeal pouch and ventricle. The action of the muscle, in its lower part, is to raise the fore part of the thyroid cartilage, and to decrease the tension of the vocal cord; the upper part depresses the arytenoid cartilage. Their action, as a whole, is probably to assist the crico-thyroids in regulating the tension of the vocal cords, and the width of the aperture of the glottis, in the production of high and low pitched notes.

The **arytenoid muscle** passes straight across the back of the larynx, its fibres being attached to the whole extent of the posterior concave surface on the back of each arytenoid cartilage. Its action is to draw together the arytenoid cartilages, this movement being also accompanied by depression from the nature of the crico-arytenoid articulation.

The **aryteno-epiglottidean muscle** decussates at its origin with the latter muscle, and passes forwards mainly in the aryteno-epiglottidean fold. Its action is to draw together the arytenoid cartilages, and to draw down the epiglottis, so as to contract the upper aperture of the larynx.

The Mucous Membrane and Glands of the Larynx.—The laryngeal mucous membrane is thin and

of a pale colour. In some situations it is closely adherent to subjacent parts, especially over the epiglottis, and still more over the true vocal cords. Above the glottis it becomes extremely sensitive. In and near the arytenoepiglottidean folds it covers a quantity of loose areolar tissue, which in disease is liable to become infiltrated, and œdematous. Like the mucous membrane over the rest of the air-passages, that of the larynx is covered to the greater part of its extent with columnar ciliated epithelium, by the vibratory action of which the mucus is urged upwards. The cilia are found as high as the widest part of the epiglottis in front, and at the sides a little above the false vocal cords; above these points it gradually assumes the stratified squamous form of the pharynx and mouth. Upon the true vocal cords the epithelium is also squamous, although above and below them it is ciliated columnar. Glands are found plentifully distributed over the lining membrane of the larynx, secreting an abundance of mucus. Their orifices may be seen almost everywhere except on and near the true vocal cords.

Vessels and Nerves of the Larynx.—The arteries of the larynx are derived from the superior thyroid, a branch of the external carotid, and from the inferior thyroid, a branch of the subclavian. The veins join the superior, middle, and inferior thyroid veins. The lymphatics are numerous and pass through the cervical glands. The nerves are supplied from the superior laryngeal, and inferior or recurrent laryngeal, branches of the pneumogastric, joined by branches of the sympathetic. The superior laryngeal nerves supply the mucous membrane

and also the crico-thyroid muscle, and in part the arytenoid muscle. The inferior laryngeal nerves supply in part the arytenoid muscle, and all the other muscles except the crico-thyroid. Numerous ganglion cells are found on the branches of the nerves, both on those which enter the muscles, and also underneath the mucous membrane.

Development of the Larynx.—During childhood the growth of the larynx is very slow, and up to puberty the dimensions are similar in the male and female. The chief characters at this period are the comparative slightness of the organ, and the smooth rounded form of the thyroid cartilage in front. These conditions are permanent in the female, except for slight increase in size. In the male, however, at puberty the larynx undergoes remarkable changes, becoming nearly doubled in size, and the cartilages becoming thicker, larger and stronger, the thyroid projecting forwards in front so as to form the Pomum Adami. From these changes it results that the vocal cords are lengthened. The adult male larynx becomes thus altogether one-third larger than that of the female. Towards middle life the cartilages first show a tendency to ossify; this commences first in the thyroid cartilage, then in the cricoid, and lastly in the arytenoid cartilages. In the thyroid it usually begins in the cornua and posterior border. The cricoid becomes ossified at its upper border on each side near its articular surfaces, and the process invades the lateral halves before encroaching in front or behind. The arytenoids ossify from below upwards.

Foreign Bodies and Injuries.—Among the foreign

bodies which are recorded as having found entrance to the larynx are leeches, buttons, ears of corn, bones, pieces of bread, coins, nut shells, cotton-wool, thimbles, screws, false teeth, nitrate of silver, pieces of breakfast cup, &c.

Some have been known to be retained over long periods of time; in a case of Dr. Whister's a bone was removed after being lodged between the cords for five weeks.* The position where the foreign body lodges varies; the arytenoids, the vocal cords, or the tissues adjoining the cricoid may all serve as the site of impaction. Fish-bones often leave excoriations in their passage, near the epiglottis or other parts of the pharynx, the sensation of which may be referred to the neighbourhood of the larynx for some days after, and give rise to the suspicion that the foreign body is still present. In some cases the bone may penetrate deep into the mucous membrane.

The symptoms of impaction of foreign bodies in the larynx are of course urgent and alarming, and require prompt treatment. In children to suspend the patient head downwards, and to slap the back, is the best means to effect dislodgement. When there is no impending suffocation examination should be made with the laryngoscope, and if possible removal effected with the laryngeal forceps; but when urgent symptoms are not relieved tracheotomy must be performed. External operation for removal may have to be resorted to.

Fracture of the cartilages of the larynx occurs not very infrequently from blows on the neck; a detachment of a portion of the hyoid bone is the most common accident.

* "Lancet," 1876, vol. ii., p. 778.

Fracture of the thyroid or cricoid cartilage is extremely dangerous not only on account of the immediate danger of spasm, but from the risk of cellular inflammation of the neck, and septic pneumonia. Tracheotomy must be performed when attacks of spasm are present. Wounds of the larynx from outside, as in stabs or attempted cut-throat, occasionally give rise to the formation of bands or webs between the cords, which may ultimately require operative treatment.

Acute Laryngitis.—Acute catarrhal inflammation of the larynx may be due to direct exposure of the throat to cold, or may be part of a general catarrh; some persons being liable when they catch cold to have the throat become affected before the nose. Besides this catarrhal cause, laryngitis may complicate the exanthemata, diphtheria and erysipelas. A certain amount of bronchitis is not infrequently also present.

Œdema of the larynx may result from local or systemic disease.

The laryngoscopic appearances are usually—first some general congestion, and tendency to dryness of the mucous membrane; afterwards there may be increased secretion of mucus. In those whose laryngitis is due to exposure to draughts, or using the voice in cold air, the dry condition of the larynx is most frequently seen.

Should œdema commence, the condition requires careful watching; as in those past middle life it may rapidly prove dangerous to life. The parts most frequently affected by œdema are the ary-epiglottidean folds; but the false bands or other parts of the larynx may also be

involved. It is seen on examination as a bright-red swelling of the mucous membrane, somewhat similar to that seen in laryngeal phthisis, but less solid than in that disease; the colour of the latter also being usually pale instead of red. The colour, however, varies in both diseases.

The symptoms are dryness, or excess of secretion, soreness, cough, pricking sensations, aphonia, and more or less dyspnœa. Acute laryngitis in children may give rise to symptoms of laryngismus stridulus, and probably requires to be only slight to occasion troublesome attacks.

FIG. 15.—Œdema of Larynx (Burow).

Treatment.—In a mild attack the inhalation of benzoin vapour, and wearing a hot compress usually prove efficient. When œdema or spasm appear the sucking of ice should be at once resorted to, and scarification may be advisable; though it is not a very satisfactory measure. In persons passed middle life tracheotomy should not be delayed if the œdema is progressing, as these cases prove very treacherous.

Insufflations of morphia (gr. $\frac{1}{8}$-$\frac{1}{4}$) or spraying the larynx with cocaine will assist in allaying spasm in adults; but are best avoided in children.

Singers and others who use the voice professionally should be warned against attempting to use it while inflammation is present.

If the condition is becoming sub-acute, astringent sprays may be used, such as alum (gr. viii. ad ℥ j.), or zinc chloride (gr. ii. ad ℥ j.).

Chronic Laryngitis.—The causes of chronic inflammation of the larynx are the same as the acute, it being frequently a sequel to that condition; or it may result from overuse of the voice, among clergymen, teachers, singers, hawkers, &c. Those who use the voice professionally out of doors are specially liable to it. The larynx may be involved in the various diseases of the nose by functional impairment of those air-passages; as in atrophic rhinitis, which produces a dry larynx, owing to the air being insufficiently warmed. A similar result takes place when the nose is blocked and the patient becomes a mouth breather. Habitual working in draughts, or a dusty atmosphere, will also result in dry forms of laryngitis. Alcohol has a very definite effect in producing chronic laryngeal affections, (particularly the abuse of spirits).

The change of voice in boys at puberty also results in a temporary sub-acute laryngitis.

The symptoms are usually some irritation and pricking in the throat, with frequent desire to clear it of mucus.

Alteration in the voice may show itself as hoarseness, or as liability to become easily tired. Though there is frequently a tendency to dryness of the mucous membrane, yet in one form of chronic laryngitis, known as

laryngorrhœa, the larynx secretes an excess of watery mucus. This may be accompanied by no marked congestion of the larynx or other physical signs; and is probably closely analogous to rhinorrhœa of the nasal mucous membrane, which is more frequently met with.

The **laryngoscopic appearances** vary mainly with the causation and duration of the malady. The alteration perhaps most frequently seen with the mirror is some localized or general congestion of the vocal cords, and neighbouring structures. Small masses of dried mucus may be seen scattered over these parts when the laryngitis

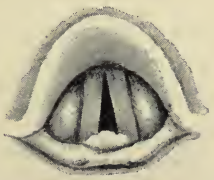

FIG. 16.—Thickening of the interarytenoid fold.

has assumed the dry form. When the disease has been present a considerable time, and particularly in those in whom it is due to overuse of the voice, various parts of the larynx may show thickening.

The interarytenoid fold is probably the most frequent site of hypertrophy, the mucous membrane being thickened, and projecting between the cords on phonation, preventing their full approximation. This condition is specially characteristic of the abuse of spirits, and is associated with general irritability of the fauces; the latter responding but little to the use of cocaine. One or other ventricular band may be enlarged, and project so as to

obscure the vocal cord; this being noticeable specially on phonation, and the voice suffering in consequence.

In teachers, particularly those engaged in the Board Schools, the vocal cords may become congested over a small area, this assuming a bright colour as if a small vessel had given way. Small papillomata, the size of a pin's head, are not infrequently developed on these inflamed portions.

Sub-glottic swelling is rare, but may occasionally be seen as a red swelling of mucous membrane below the vocal cord.

The cords may be impaired in their movements by the mechanical impediment set up by thickening of the tissues. The cord is as a rule only partially fixed, and the other one may compensate for it by moving across the middle line. Papillomata and polypoid hypertrophy may occasionally result from the affection.

The disease is very inveterate, and most cases are difficult to cure, unless a definite exciting cause can be removed.

Treatment.—When any pain in the throat exists, soothing inhalations should first be used, such as the vapour of benzoin; and subsequently astringents. The best means of applying the latter is by a fine spray apparatus.

The following solutions may be used:—

Nebula aluminis gr. viij. ad ℥ j.

Nebula zinc. chlor. gr. ij. ad ℥ j.

Nebula ferri aluminis gr. iij. ad ℥ j.

The spray should be inspired well into the larynx.

Painting astringents into the larynx with a camel's hair brush is also useful, such as:—

Ferri perchlor. gr. 60 to ʒ j.

or Zinci chlorid. gr. 15 to ʒ j.

The vapour of creasote is a useful stimulating inhalation.

℞ Creasot. ♏xl.
Magnes. carbon. levis gr. xxx.
Aq. ad ʒ j.

ʒ j. for each inhalation in a pint of water at 140° F.

For excessive secretion of mucus the vapour of cubebs may be used.

℞ Ol. cubeb. ♏ xl.
Magnes. carbon. levis gr. xx.
Aq. ʒ j.

ʒ j. to a pint of warm water at 140° F.

The patient should rest the voice as far as possible. The question of stimulants is important, most inflammations of the larynx being better without them.

Laryngeal abscess is rare, but it is occasionally met with, and apparently from no very definite cause. The abscess may be situated at the root of the epiglottis, in the ventricular bands, or the ary-epiglottic fold.

Opening with a laryngeal lancet is the most efficient treatment. The prognosis is usually good.

Functional aphonia is met with in persons of any age, but occurs most frequently in young women. The subjects of it do not necessarily show any deterioration of general health, though anæmia is not infrequently present; and the patients are often nervous and hypersensitive. Any nervous shock, such as sudden bereavement,

will often prove the starting point of aphonia. The characteristic symptom is the sudden and complete loss of voice, with as equally quick return of it after a longer or shorter interval. With this history the affection may reasonably be suspected.

The usual laryngoscopic appearance is failure of the cords to adduct on phonation, but not infrequently the patient will phonate the "eh" when the mirror is in position, and lose the voice again on its withdrawal, a diagnostic sign of the affection. The application of the faradic current with a laryngeal electrode, or of strong astringents to the larynx, will confirm the diagnosis, and

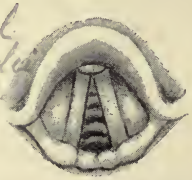

FIG. 17.—Position of vocal cords in functional aphonia on attempted phonation.

prove efficient treatment. Where constitutional weakness exists however, it is best to resort first to milder measures of treatment; giving tonics, and iron if anæmia is present. A stimulating inhalation may also be used, such as the vapor ammoniæ (equal parts of liquor ammoniæ and water). Firmness in treatment is very essential in restoring the voice. In a few cases it will remain lost for long periods of time, in spite of the application of strong intra-laryngeal faradism.

Paresis of Tensors.—This is a variety of functional aphonia, due most frequently to overuse of the voice. It

is met with chiefly among singers, and teachers, &c. The laryngoscope shows the cords meeting at both ends, but separated in the middle, presenting a bowed form.

Rest of the voice, and the use of the faradic current to the cords are the measures indicated.

Spasm of Adductors.—A still more exceptional form of functional disorder of the larynx is to have both cords fixed in the middle line in a continual condition of spasm. This arises from the same neurotic tendencies as the commoner affection. It is characterized by extreme dyspnœa, the voice suffering from the shortness of breath, and sounding forced.

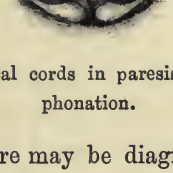

Fig. 18.—Position of vocal cords in paresis of tensors on attempted phonation.

Its functional nature may be diagnosed by the fact that the patient breathes well during profound sleep, the condition commencing again on waking; and also from the improvement in the breathing, if the patient's attention is diverted for a moment, as on the introduction of the laryngeal mirror.

Spasm of adductors is also met with occasionally in rickety children, as laryngismus stridulus.

"Laryngeal crises" are attacks of spasm of the adductors, in locomotor ataxy. Abductor paralysis is said to be a functional disorder in very rare cases; it may be

known from the present affection by the stridor only being marked on inspiration; expiration being noiseless, and speech unaffected.

Treatment.—Faradism and constitutional measures, as in the commoner functional disorders, prove equally efficient for spasm of the adductors.

For laryngismus stridulus, cod-liver oil and tonics should be given. The child should be sponged with cold water three times a day. Ammonia smelling salts frequently prove effectual for the attacks. Chloral hydrate has also been recommended.

Laryngeal Cough.—A peculiar form of functional cough is occasionally met with in children and young adults; and without any very definite cause. The noise produced is often very remarkable; it may resemble the barking of a dog, the quack of a duck, or may be of a deep sepulchral character.

Treatment.—Painting the throat with a strong astringent will frequently induce the patient to control the cough. Constitutional measures, and change of scene when possible, should be adopted.

Laryngeal Vertigo.—There is a variety of nervous affection, characterized by frequent attacks of laryngeal spasm, accompanied by partial or complete loss of consciousness.

Charcot has recorded the notes of four cases, and regards the disorder as a laryngeal vertigo allied to Meniére's disease; the afferent path being the superior laryngeal nerve. The main features are a sudden falling to the ground, immediately preceded by a short dry cough,

and somewhat spasmodic breathing. Subjectively the patient is almost always annoyed by a tickling or burning sensation in the larynx.

The attacks can sometimes be brought on by the patient by such an act as drinking cold water. A spasm of the whole of the upper air-tract then supervenes, the patient becomes dusky in the face, partially unconscious, and in a few seconds the attack passes off. If the cords are observed with the laryngoscope during the onset of an attack, they are seen to go into a condition of tremor before the spasm supervenes.

Benign growths in the larynx may occur in persons of any age, sex, or occupation. The last of these exerts a very decided influence in their production. They may be congenital in exceptional instances. The fact of their being actually present at birth is of course difficult to prove; as the majority of recorded cases which proved fatal have not died till a year or more old. One conclusive case was met with by Dr. Edis, in which a congenital cyst was found in the larynx of an infant 37 hours after birth. The tumour was the size of a large bean and pressed on the rima glottidis.* Other cases where the evidence pointed strongly to the congenital nature of the growth have also been recorded.*

Of the different varieties of growths, papillomata are by far the most frequent; but mucous polypi, fibromata, and cystic tumours have also been met with, and very exceptionally true mucous, fatty, glandular, and vascular tumours. The vocal cords are the most frequent site of

* Obstet. Soc. Trans., vol. xviii., 1876.

growths; but they also occur on the ventricular bands, interarytenoid fold, and epiglottis, but rarely on the arytenoids themselves.

The time of life at which they most frequently occur is between the ages of twenty and fifty; and here the influences of occupation and other exciting causes such as chronic laryngitis are most felt. Males are more frequently affected than females from the same reason. The overuse of the voice in adverse surroundings, such as in the open or in crowded rooms, acts most as an exciting cause. Thus they are met with more frequently among

FIG. 19.—Multiple papillomata in a boy.

hawkers, vocalists, and teachers. Among board-school teachers the influence of laryngitis in giving rise to growths is most definitely seen; lines of congestion and enlarged vessels being met with leading up to the growth. Gardeners whose occupation subjects them to attacks of laryngitis are also liable to them.

Syphilis seems definitely, in some instances, to act as a predisponent to papillary growths in the larynx.

Of the symptoms given rise to, the most prominent is the alteration in the voice. The amount of this alteration depends on the size and situation of the growth. Where

* Mackenzie's "Growths in the Larynx," p. 14 and appendix.

they are situated between the cords and prevent their approximation, the aphonia may be complete; more usually the voice is rough and husky. A sudden loss of voice while speaking and regaining it suddenly is somewhat characteristic of growths; though this also occurs in functional aphonia, but usually over longer periods of time in the latter affection. The ordinary voice may not be interfered with, but the use of it for singing may be lost. Other symptoms such as dyspnœa and cough may be present; sudden attacks of the former occurring from the growth getting in between the cords, or by the patient having an attack of laryngitis, supervene.

Diagnosis.—Though the laryngoscope is usually available in adults for diagnosing the presence of growths with certainty, yet in the case of young children this method may be impracticable, and the diagnosis may have to be based upon symptoms. Of these the most important are dyspnœa, prolonged aphonia, and occasional attacks of spasm.

In laryngismus stridulus symptoms of a like character may be present, but the dyspnœa will be absent between the attacks, and the voice is natural. The duration of the disease will also serve as a factor in diagnosis. The very exceptional occurrence of a post-œsophageal abscess might also lead to error in diagnosis. In adults the chief difficulties in examination are a pendant epiglottis and irritability of fauces; these can, however, usually be overcome by practising the patient, and using cocaine.

The **laryngoscopic appearances** vary with the nature of the growth. The surface may be smooth, or

warty and cauliflower like in contour. The colour may be pale and like the mucous membrane from which it grows, or slightly redder. The size varies from a grain of mus-

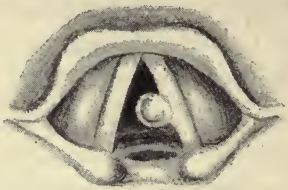

FIG. 20.—Simple papilloma on left vocal cord (Burow).

tard to the dimensions of a walnut; a size commonly seen being about that of a split pea. There is frequently a distinct pedicle, which separates easily when the growth is

FIG. 21.—Cyst of epiglottis (Mackenzie).

seized. The cauliflower-growths are usually friable in structure, and grow somewhat rapidly. Cysts are seen as smooth rounded swellings of the same colour as the mu-

FIG. 22.—Fibroma of left ventricle of Morgagni (Burow).

cous membrane, and are situated usually on the epiglottis. Angeiomas are exceedingly rare; they are of red purplish colour.

The most essential point for diagnosis, *i.e.*, that between the benign and malignant growths, will be referred to under the latter heading.

Recurrence occur not very infrequently after removal, mostly where small portions of the growth have unavoidably been left, and also after intervals of many years from the patient being again subject to the exciting cause.

Histology.—Microscopically papillomata of the larynx are found to correspond in structure and mode of development with papillary growths in other parts of the body. They have occasionally been found coincident with warty growths over the skin. Their basis substance is composed of connective tissue continuous with that normally existing in the part. Covering their surface is a layer of epithelium, of varying thickness. It is usually of the tesselated, but very occasionally, of the ciliated columnar variety. Fibrous tissue is rarely an important element of them. Blood-vessels may be found entering the base of the papilla, and enlarged racemose glands are occasionally included in the group.

Benign epithelial growths consist of hypertrophy of the normal epithelial cells of the part, and may show in their structure little or no connective tissue. They are usually met with upon or near the vocal cords.*

True fibromata, consisting of white fibrous tissue, are most frequently situated on the true vocal cords, they are occasionally also met with on the ventricular bands, and epiglottis. They usually grow from the submucous tissue,

* Mackenzie's "Growths in the Larynx," p. 26.

but are supposed also to sometimes arise from the perichondrium.

Fibro-cellular growths or *mucous polypi* are nearly always pedunculated, and may be attached to the epiglottis or the vocal cords. They consist of delicate interlacing fibro-cellular tissue, through the substance of which is diffused a greater or less quantity of serous-like fluid. Unlike polypi of the nose, they show no tendency to recurrence in the larynx.*

Fasciculated sarcomata are comparatively unfrequent in the larynx, and from their constant tendency to recurrence deserve probably to rank as intermediate between benign and malignant growths.† They are characterised by long fusiform cells, with tapering extremities. There may also be in some part of the growth a development of fibrous tissue. The cells are nucleated, with granular contents. They may grow from any part of the larynx.

Growths in which the elements are mixed, and which it is difficult to separately classify as belonging to one group, are not infrequently met with.

Other forms of growth, such as *true adenomata*, *angeiomata*, and *lipomata*, &c., are so rare as hardly to need description in the present work.

One peculiar and unusual form of recurrence is to have a number of small satellite growths occur over the glottis, shortly after removal of the original one.

Treatment.—Removal by intra-laryngeal means is essentially in all cases the best, if possible. In very

* *Ibid*, p. 48.

† Paget, "Lectures on Surgical Pathology," p. 591.

young children it may however be impracticable, and tracheotomy has to be resorted to in not a few of these cases. When this operation has been performed, the growths may sometimes be removed with the forceps, under an anæsthetic, inserting the finger as a guide into glottis. Splitting the thyroid cartilages, and thus removing them, is to be avoided, mainly on account of the risk

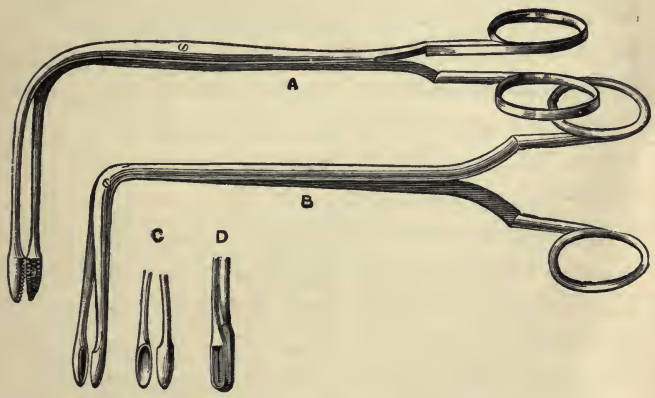

FIG. 23.—Mackenzie's Laryngeal Forceps. A. Lateral forceps. B. Antero-posterior forceps. C. Cutting forceps. D. A variety of cutting forceps in which one blade only cuts, while the other presents a flat surface.

to the voice. Another method is to remove the growths from below through the tracheotomy wound.

The best instrument to use for intra-laryngeal removal is Mackenzie's cutting forceps. The patient should first be trained to the introduction of the instrument at a few sittings. This will enable the operator also to judge the length of forceps required to seize the growth. With

cocaine and a fairly tolerant larynx, the smallest growth may be seized with certainty, and the operator should never be tempted to make a "shot" at it, as the other structures are so easily included in the blades, as the patient closes the glottis.

Astringents may be used to the site of the pedicle after removal, with a view to prevent recurrence. Should the latter frequently take place, the electric cautery may be used, if the larynx is sufficiently tolerant for its application.

Malignant Disease of Larynx.—Epithelioma is the most frequent form of carcinoma met with in the larynx. Sarcoma, generally of the spindle-celled kind, is very occasionally met with.

The ventricular band, or the true vocal cord, are the parts where the disease most frequently first shows itself; but the epiglottis is occasionally the first site of the growth, and much more exceptionally the arytenoid is the part primarily seen to be involved. In most of these positions, however, the extent of the disease may be much deeper than what is at first revealed by the laryngoscope. The age at which cancer of the larynx occurs is the same as in other parts of the body; those in advanced life being more prone to the disease, but in them the progress is slower; while in those attacked earlier in life it runs a more rapid course. The growth seems to be more rapid when the epiglottis is first attacked. Males are more frequently its subjects than females in the proportion of nearly four to one. Benign growths of the larynx, as elsewhere, may become malignant subsequently. It has

been suggested that the irritation set up by the removal of innocent growths sets up the latter action, but the collective investigation of Dr. Semon on this point negatives this supposition fairly conclusively.*

The duration of life is from about eighteen months to two years after the disease has commenced.

The symptoms chiefly complained of are loss of voice, pain, dyspnœa, dysphagia, and occasionally hæmoptysis. The aphonia may result from the obstruction of the growth to the passage of air, but more usually from impairment in the movement of the cord on the side affected. Dyspnœa and dysphagia come on sooner or

FIG. 24.— Commencing epithelioma of left vocal cord, involving its anterior extremity, and presenting a slightly nodular surface.

later in all cases. Pain is nearly always present, and pain shooting to the ear is a very characteristic symptom. Hæmoptysis may result from ulceration of the growth, but is not always present. Fœtor of breath may also be present. The cancerous cachexia usually only shows itself very late in the disease.

The first appearance seen by the laryngoscope, in elderly patients, is not infrequently a slight warty growth replacing a small portion of one vocal cord, and hardly elevated above the level of the latter. The voice may be

* "Lancet," 1888, vol. ii., p. 33.

a little husky, with some pain shooting to the ear, but beyond these symptoms there may have been little to call the patient's attention to his throat.

In other cases the growth may be situated on the surface of the cord and may present a definitely warty

Fig. 25.—Epithelioma replacing left vocal cord, with swelling of ventricular band.

appearance. When the ventricular band is first involved it may be seen as an uniform rounded swelling without ulceration or excrescences.

If the arytenoid is the part of the larynx first attacked,

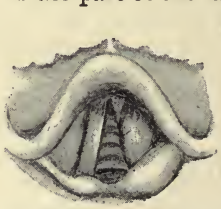

Fig. 26.—Malignant disease of left ventricular band, with œdema of left arytenoid.

the fixation of the cartilage is usually complete, the tumour has a nodular surface; and the dysphagia is a more prominent early symptom.

Œdema is liable to come on during the course of malignant disease and to obscure the original growth. Peri-

chondritis also supervenes as the growth spreads, and in some cases the cartilages may be extensively exfoliated. The glands are only implicated, as a rule, late in the case, a point of importance in favour of extirpation of the growth, and a diagnostic sign not to be waited for if such treatment is to be carried out.

The colour of malignant growths in the larynx is usually pale, there is rarely much congestion.

Diagnosis.—The most diagnostic physical signs are the presence of new growth, which gradually invades surrounding structures; impairment in the movement of the cord; and ulceration.

New growth always precedes the ulceration, and the latter may not be present till the disease has existed for some time. Impaired movement of the cord is usually manifest early in the course of the disease. It is probably the most diagnostic sign in distinguishing from benign growths. Though it may be present with the latter its purely mechanical nature is usually evident; whereas in malignant disease the fixation of the cord is out of all proportion to the amount of growth seen with the laryngoscope, and indicates its infiltrating nature. Benign growths also show no ulceration; the history and age of the patient also helps to differentiate. The diagnosis from tubercle and syphilis has also to be considered. In syphilis the growth and infiltration supervene on the ulceration, the latter being the most prominent feature, whereas the converse of this is found in cancer, *i.e.*, the growth precedes the ulceration.

In syphilis also the tissues have as a rule an inflamed

and angry look, and the disease is rapidly destructive, unless arrested by iodides. It should be remembered in using specific treatment for diagnosis between the two, that malignant growths may for a short time show decided amelioration under iodide of potassium.

In tubercle there is perhaps the most difficulty in diagnosis, as the ventricular band or one end of the vocal cord may become swollen, and subsequently present shallow ulceration with inflammatory new growth at the edges. The swelling is, however, more of the nature of œdema, there is usually less impaired movement of the cord, and the new growth shows no infiltrating tendencies. The evidence of tubercle in the lungs will usually confirm the diagnosis. When perichondritis has supervened, and all growth is obscured, the diagnosis can only be arrived at by the general aspects of the case.

Portions of the growth can usually be removed for the microscope.

Histology.—The most characteristic element which on microscopic examination distinguishes benign from malignant growths is the presence in the latter of "nested cells" or laminated capsules. If only a small portion of the growth is obtained for examination, these may not be found, and the case may be taken for one of simple papilloma. Fibrous tissue may also be developed in excess in these growths. The epithelial element tends to invade the surrounding tissues; but it would of course be difficult to obtain a portion of the growth deep enough to show this for purposes of diagnosis during life.

Treatment.—The question arises when an early dia-

gnosis is made as to whether extirpation of the growth should be attempted. Tracheotomy will in all cases sooner or later have to be performed; and though the risk of the operation is decidedly increased by dividing the thyroid and removing the growth with the adjoining soft structures, yet considering the slowness with which the lymphatics become involved, there seems good reason for allowing the patient this chance of cure. When, however, the disease has implicated deeper structures, and the cartilages have to be removed, the performance of palliative tracheotomy probably gives a greater chance of prolonging life. The chief risk in extirpation of the larynx is septic pneumonia. Very successful results have here and there been obtained, after removal of portions of the cartilage; but the general evidence seems so far against total extirpation.

Arsenic or iodide of potassium may be given to delay the new growth; and morphia insufflations will assist in relieving pain.

The Muscles of the Larynx.

Before alluding to the different forms of laryngeal paralysis, the action of the muscles in effecting the movements of the cords may be briefly alluded to.

Adduction of the cords in ordinary vocalization is effected by the lateral crico-arytenoids, assisted by the arytenoid. The thyro-arytenoids and crico-thyroids probably also assist to a less extent. These latter muscles regulate the tension of the cords.

Tension of the cords in the production of high and low notes is produced probably by the thyro-arytenoids and crico-thyroid muscles.

Abduction of the cords is effected by the posterior crico-arytenoids. All these muscles are supplied by the inferior laryngeal nerve, except the crico-thyroid which receives its motor filaments from the superior laryngeal; the latter nerve also partially supplying the arytenoid muscle.

The adductors are the stronger group of muscles and are essentially the muscles of volition, being affected mainly in functional aphonia, while the abductors have a reflex action, and suffer more in organic disease.

The accessory part of the spinal accessory nerve, which supplies the motor filaments to the pneumogastric for the laryngeal muscles, arises from the medulla oblongata.

Paralysis of the Vocal Cords.—Those cases only will be here described which are due to organic disease, excluding those of a functional nature, and those cases in which the cord is impeded in its movements by growths, or other hypertrophies of the mucous membrane.

Two main clinical facts may be recognized as characterising nearly all cases of laryngeal paralysis. First, that the abductor muscles are either affected alone; or that where both sets of muscles are affected, the abductors suffer earlier and more severely than the adductors.

Secondly, that the paralysis is more frequently on the left side than the right.

The proneness of the abductors to be attacked by paralysis sooner than the adductors is seen both in cases of

pressure on the nerves, in disease of central origin, and in the so-called cases of myopathic paralysis. Various hypotheses have been given in explanation of the fact. It has been supposed that the abductor fibres of the nerves were situated more superficially than the adductor fibres, and that this would account for it in the cases of compression. Dr. Gowers has pointed out that the adductor muscles of the larynx act at greater mechanical advantage; being inserted into the base of the arytenoid at a right angle from their point of origin, instead of an acute angle, as is the case with the abductor muscles.

Stimulation of the cut ends of the recurrent nerves has been observed, by Dr. Semon and others, to be followed by contraction of the adductors. From the two above considerations it appears that the adductors are essentially the stronger muscles; so that where both sets of muscles are equally influenced by disease, the abductors would be more likely to show signs of paralysis first.

Dr. Ferrier has pointed out that the abductors and extensors all over the body are weaker than the flexors and adductors; and this rule may also possibly be applied to the larynx. It may be remembered that the adductors, being concerned in vocalization act through volition; whereas the abductors are more essentially reflex in character.

The fact of the left side being more frequently affected than the right has long been recognised, and is also illustrated in comparative pathology in the disease known as "Roaring" in horses, which is always due to left recurrent laryngeal paralysis; the right side having been rarely

if ever known to be affected.* The greater exposure of the left recurrent to pressure accounts for the majority of cases.

Causes.—Laryngeal paralysis may be due to central brain disease, or to affection of the laryngeal nerves. True myopathic paralysis has also been described by authors.

Among the brain diseases affecting the laryngeal centre† may be included cases of encephalitis, cerebral syphilis, disseminated sclerosis, general paralysis, apoplexy, disease of pons and medulla, tabes dorsalis, lead poisoning, and also possibly with these may be included typhoid fever.

The nerves of the larynx may be affected probably either by neuritis or by pressure in some part of their course. The chief causes of acute neuritis are rheumatism and exposure to cold. Though neuritis of the laryngeal nerves is very probable, it is not yet absolutely proved to occur.

Paralysis caused by pressure may involve the superior laryngeal, the recurrent laryngeal, or the trunk of the pneumogastric.

Paralysis of the **superior laryngeal** is a rare affection due as a rule to diphtheria or to implication of the nerve in tumours, &c. As it supplies the sensory fibres to the larynx and the motor nerve of the crico-thyroid muscle, the physical signs are want of sensation in the mucous membrane, and want of tension in the vocal cord on adduction,

* Fleming "Roaring in Horses," 1889.

† The laryngeal cortical centre is stated to be at the posterior part of the third frontal convolution.

(the cord presenting a wavy outline at its free border). There is no marked aphonia, but a loss of high notes and perhaps some hoarseness.

Paralysis of the **recurrent laryngeal** may be due to pressure from enlarged bronchial and cervical glands, aneurisms, thyroid enlargements, cancer of œsophagus, mediastinal tumours, tuberculosis, chronic pleurisy, cysts in the neck, &c., or more rarely possibly from neuritis.

In some instances the main **pneumogastric** trunk may be pressed upon; in these cases (usually cancer in the neck) besides the paralysis of the cords, there is tendency to cardiac syncope and severe attacks of dyspnœa. Besides the cases of central and peripheral nerve paralysis, cases have been described where the muscle only is diseased, *i.e.*, true myopathic paralysis. Instances have been recorded in which the abductors of the cords were found on autopsy completely atrophied, and where no manifest changes could be discovered in the nerves or brain.*

Clinical Varieties of Laryngeal Paralysis.—Under this heading will be described the chief forms of laryngeal paralysis due to organic disease as seen with the laryngoscope, and the indications as to possible cause will be alluded to. Very definite lines as to diagnosis cannot, however, be laid down in each instance, and many cases of laryngeal paralysis remain obscure after all the physical signs have been taken into consideration. A sudden onset, as a rule, probably indicates an acute neuritis, of which the most frequent causes are cold and rheumatism;

* Mackenzie's "Diseases of Throat," vol. i.

while a gradual onset indicates pressure on the nerves, or a progressive nerve lesion, such as syphilis, locomotor ataxy, &c.

Abductor Paralysis of Left Vocal Cord.—This is the most frequent form of laryngeal paralysis met with, and may be due to several causes, the chief being those of pressure in the chest on the recurrent laryngeal. Enlarged bronchial glands, aneurism, pleurisy, syphilitic disease, mediastinal tumours, &c., may be the primary cause of the pressure. The onset may be slow or somewhat rapid, not infrequently the patient complains that the affection of the voice came on slowly after an attack of

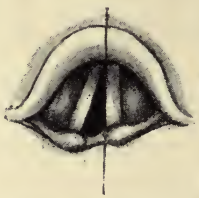

FIG. 27.—Abductor paralysis of left vocal cord.

bronchitis. On examination with the laryngoscope the left cord is seen to remain near the middle line, and not to abduct on deep inspiration.

The ordinary voice is in many cases very slightly affected, only failing on prolonged effort, and there may be no manifest dyspnœa except on extra exertion; this latter, as a rule, being due more to the accompanying disease in the chest.

When the movement of abduction is only impaired improvement may in some cases take place, but as a rule the condition remains permanent.

The examination of the chest, and the history of onset and previous diseases, such as bronchitis, are the most important guides as to cause.

Abductor and Adductor Paralysis of left cord.—When the left recurrent nerve becomes completely paralysed, both sets of muscles on that side fail to act,

FIG. 28.—Atrophy of left posterior crico-arytenoid muscle, from a case of syphilis.

and the left cord is seen in a position midway between complete adduction and abduction. The other cord may be seen to compensate for its fellow and move across the middle line on phonation.

It is sometimes difficult to say how much the adductor muscle is affected, and to distinguish it from the previous form of paralysis, as probably the adductor might be

partially paralysed, and yet be able to effect adduction.

The ordinary voice sounds somewhat forced, and altered in pitch; prolonged use of it, and singing are also interfered with. There is no dyspnœa present from the paralysis; though some may be set up by the original disease, if pressure on the recurrent laryngeal is the primary cause. There is inability to effect an explosive cough.

In the accompanying figure the right cord will be seen to have moved across the middle line on phonation, to compensate for the other cord which is immobile. The case was probably a neuritis, as it occurred in a young girl; the onset had been sudden so far as could be judged,

Fig. 29.—Abductor and adductor paralysis of left vocal cord.

the paralysis was complete, and there was no reason to suspect disease in the chest.

Abductor paralysis of right cord may occur in conjunction with that of the left, or alone. By itself, it probably occurs most frequently from pressure on the right recurrent or the right trunk of the pneumogastric. The physical signs and symptoms are similar to those of the left side.

Abductor and Adductor Paralysis of right cord.—When complete and unilateral, this is probably due

most frequently to neuritis, of catarrhal or rheumatic origin, particularly if the onset has been sudden. It may also occur from complete compression of one of the nerves. The physical signs, &c., are the same as for the corresponding paralysis of the left side. Note should be made in making laryngoscopic examination as to whether there is evidence of disease of the crico-arytenoid joint, as this may result in fixation of the cord.

Abductor Paralysis of both cords.—This unusual form of paralysis is met with occasionally as a complete condition, both cords remaining close to the middle line and failing to abduct. The history in some of the cases is that the patient from some exposure to cold or from an attack of rheumatism, experienced within a few hours distressing dyspnœa, and that since this sudden onset the condition had not altered. In other cases, however, the affection may have been slowly progressive, and in these cases, the possibility of pressure on both recurrents, by aneurism, or by thyroid enlargement, or cancer of œsophagus, involving those nerves or the trunk of the pneumogastric must be taken into consideration. Syphilis and locomotor ataxy may also act as causes, and in these diseases the onset is slow.

These cases have also been attributed to true myopathic paralysis, and cases have been met with where autopsy was obtained, in which the posterior crico-arytenoids were found atrophied, and the nerves and brain were apparently healthy. The existence of this purely myopathic origin has however been disputed, it being of course difficult to prove the non-existence of a nerve lesion. Both the

nerves and muscles are exposed in the larynx more than elsewhere to catarrhal or traumatic inflammation. In support of the myopathic theory, comparison has been made between the abductor muscles of the larynx, and the muscular structure of the heart, as being reflex muscles constantly in action. Besides in the heart, true myopathy is also met with in Duchenne's paralysis (pseudo-hypertrophic paralysis). Subsequently to the abductors being involved, the adductors may also slowly become paralysed; in which case the dyspnœa improves, but the voice becomes lost, and the patient looses the power to effect an explosive cough.

Bilateral paralysis of posterior crico-arytenoids

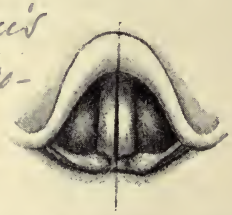

Fig. 30.—Bilateral paralysis of abductors.

The laryngoscope shows the cords remaining near the middle line, and not abducting on deep inspiration, unless to a very slight extent. The disease should not be mistaken for a rare form of hysterical aphonia in which the adductors are in a condition of spasm and keep the cords in the middle line, in this affection by distracting the patient's attention for a moment the cords will be seen to abduct.

The most prominent symptom is the dyspnœa, which prevents the patient either hurrying or talking long with any ease, and which puts him in considerable danger at

every subsequent attack of laryngitis. The voice is chiefly altered by the dyspnœa; the patient having to use considerable effort to talk, though the tone of the voice may be natural.

Cases of bilateral paralysis of abductors in which the right cord is only partially paralysed are sometimes seen. In these cases pressure on both recurrents is perhaps the most probable cause.

Treatment.—Tracheotomy is nearly always required to relieve this condition, as the dyspnœa remains a permanent source of danger to the patient, as well as incapacitating him for any laborious occupation. The tube has to be permanently worn as the paralysis is permanent.

In cases, however, where bilateral paralysis is due to pressure on both recurrents by aneurism, the risk of the operation is of course greater and the likelihood of relief to the dyspnœa being obtained much less.

Paralysis of the Arytenoideus Proprius Muscle. This form of paralysis is very rarely met with. It seems to depend on a catarrhal cause, probably giving rise to some form of neuritis.

The history, in the few cases that have been recorded, is of sudden onset of aphonia, the voice being reduced to a whisper, and no other symptoms being necessarily present. There may be a history of previous loss of voice from "colds."

On laryngoscopic examination the cords are seen to meet well for their anterior two-thirds, and to leave a triangle at the posterior (cartilaginous) portion. The con-

dition is permanent, one case now attending the Throat Hospital having lasted twenty years.* This form of paralysis should not be mistaken for a variety of chronic laryngitis which is not uncommonly seen, in which the cords are prevented from approximating at their posterior part, owing to hypertrophy of the mucous membrane forming the interarytenoid fold. The voice is in these cases husky rather than whispering, the hypertrophy of the mucous membrane can be seen with the laryngoscope, and there is no definite triangle left between the cords on phonation as in true paralysis.

FIG. 31.—Paralysis of arytenoideus proprius muscle.

Paralysis of one Lateral Adductor.—This form of paralysis is rare. It is said to be due to chronic toxæmia from lead and arsenic, and to be met with after small-pox and syphilis.† In one case of seven years standing atrophy of the crico-thyroid muscle was found. In some cases the onset has been with diphtheritic paralysis, the condition lasting many years.

Either side may be affected.

Mixed forms of paralysis are sometimes seen, and it may be extremely difficult to diagnose with the laryngoscope which muscles are affected. Occasionally the

* Mackenzie's "Diseases of Larynx," vol. i., p. 472.

† Mackenzie.

internal tensor may be paralysed with the central adductor (arytenoideus).

Some peculiar varieties of paralysis may be met with in aneurism.

Perichondritis of larynx may be met with as a secondary or primary affection. As a secondary disease it is much the more common, and it may complicate carcinomatous, syphilitic, and tubercular disease of the larynx by direct extension of these diseases to the deeper structures. It may also follow as a sequela of typhoid and the exanthemata. As a primary affection it occurs from attacks of catarrhal laryngitis.

In malignant disease of the larynx almost the whole of the cartilages may be exfoliated. The necrosis is due simply to extension of the growth to the cartilage, and occurs among the later phenomena of a large proportion of cases.

Syphilis in the tertiary stage may involve any part of the larynx, including the perichondrium, and causes general thickening of the soft structures.

In tuberculosis and struma the disease is associated with other signs of those diseases, all the soft structures of the larynx become œdematous, and in struma fistulous openings communicating with the outside of the neck may be established. Enlarged cervical glands are frequently also present.

The perichondritis in association with typhoid is most frequently seen as swelling and exfoliation of the arytenoid cartilages, the other cartilages are also less frequently involved. As a sequela of small-pox and scarlet fever the

disease is very exceptional; the arytenoids and cricoids have been found necrosed.

The appearances presented in the larynx by secondary perichondritis depend greatly on the original disease; when the soft structures have become so swollen as to prevent the latter being seen, the diagnosis has to rest on the history and general signs.

As a *primary* affection perichondritis would seem to result mainly from recurrent attacks of laryngitis. In several of these cases the cartilages have become ossified, owing possibly to the extra blood supply brought to them at each successive attack of inflammation of the mucous

Fig. 32.—Perichondritis of Larynx.

membrane. Subsequently the patient gets a more severe attack of laryngitis than usual, the soft tissues swell up, and the blood supply being cut off from the ossified cartilage necrosis results. The history in many cases would seem to confirm this as a possible sequence of events. Portions of ossified cartilage are not infrequently coughed up by the patient.

The appearances usually presented in primary perichondritis are first swelling of the soft structures, usually beginning on one side, and rapidly extending to other parts. The vocal cords become obscured by the swollen

ventricular bands, and the arytenoids and epiglottis may become more or less œdematous. As the tissues become more infiltrated the dyspnœa becomes more urgent, until tracheotomy is necessary. Besides the physical signs revealed by the laryngoscope, there may be tenderness and some thickening over the cartilages on the outside of the neck. Pain, rapidly increasing dyspnœa, and dysphagia are the most prominent throat symptoms. The voice becomes interfered with in proportion to the thickening. Other general signs of inflammation will be present with high temperature. The site of the original swelling of the mucous membrane varies with the cartilage involved. If the cricoid, the pointing of the suppuration may be sub-glottic, and will appear as a gradually increasing swelling below one or other vocal cord, and presenting at first sight the appearance of a new growth. In no doubt not a few cases the disease becomes arrested, and more or less permanent thickening of the tissues is left.

Treatment.—When any possibility of syphilis being the cause exists, iodides should be at once given. Tracheotomy is almost always sooner or later required, and the tube must be worn till the inflammation completely subsides. The relief experienced from tracheotomy in the idiopathic cases is nearly always very marked, and the inflammation, which may previously have been getting rapidly worse, in most cases tends to subside on introduction of the tube. If much stenosis has resulted the glottis may be dilated with bougies, after the inflammation has disappeared.

Syphilis of the larynx may show itself in the secondary or tertiary stage; or from the inherited taint.

When the larynx becomes involved during the **secondary** stage, the lesions are of the same type as those in the mouth; namely, hyperæmia, mucous patches, and condyloma. Secondary syphilis may act as a predisponent to papilloma of the larynx.

Tertiary lesions may involve any part of the larynx, and may occur as an acute rapidly destructive gummatous inflammation, or as a more chronic infiltration of the soft structures. Very large gummata have been met with on the epiglottis. When the ulceration is rapidly spreading, it has a red inflamed margin with undermined edges. The epiglottis may become perforated, or adherent to the wall of the pharynx; complete destruction of it sometimes taking place. On account of the difficulty in applying local treatment, tertiary ulceration may not infrequently relapse in the larynx, and though the ulcers themselves usually respond fairly readily to iodide treatment, general thickening of the tissues is apt to remain. This infiltration, and the scarring which takes place when the ulcers have healed, gradually leads to stenosis, for which tracheotomy may be necessary. Webs across the glottis occasionally result from tertiary inflammation.

Paralysis of the laryngeal muscles, usually the abductors, may occur from tertiary syphilis involving the nerve centres. Perichondritis may also complicate the tertiary manifestations in the larynx.

Inherited Syphilis.—Laryngeal symptoms in the inherited taint may appear almost immediately after birth,

and probably some laryngeal catarrh frequently accompanies the coryza, &c. The alterations in the larynx have not, however, been definitely observed till some months after birth.* The changes then are chiefly thickening and infiltration of the soft structures. The epiglottis, the aryteno-epiglottidean folds, the false and true cords, and the mucous membrane over the cricoid may all be involved. The patient suffers from a hoarse husky voice, and some dyspnœa. There is considerable danger of acute œdema supervening, which in the stenosed condition of the larynx may easily prove fatal. Numerous shallow ulcerations may be scattered over the thickened tissues; though ulceration is not necessarily present.

Thickening of the ventricular bands, with harsh husky voice, may be present when the patient is several years old, and when interstitial keratitis and other signs of the inherited taint are manifest.

Treatment.—During the infantile stage, inunction is the best treatment. Ten grains of the strong mercurial ointment should be rubbed into the palms and soles, night and morning. The treatment with mercury should not be continued after disappearance of the symptoms on account of the danger to the teeth. There is little tendency to relapse. In the acquired disease small doses of mercury over long periods should be given in the secondary stage; while iodides cure most rapidly the tertiary manifestations.

Tuberculosis of the Larynx.—It is a somewhat doubtful point whether the larynx is ever attacked by tubercular disease before the chest becomes affected.

* Simon, "Trans. Path. Soc.," vols. xxxi., xxxviii.

There are not a few cases in which definite tubercular lesions are seen in the larynx, before any physical signs can be made out in the chest, and cases in which the laryngeal symptoms remain for long in advance of the chest, but no doubt the reverse order as a rule holds good.

The most typical lesion of tuberculosis in the larynx is pale symmetrical pear-shaped swelling of the arytenoids. One arytenoid is usually affected before the other, both being subsequently attacked; and ultimately the epiglottis and other tissues. Pallor of mucous membrane is the usual, but not necessary accompaniment of these changes. Numerous shallow ulcerations, of an indolent character

FIG. 33.—Tubercle of Larynx. Pear-shaped swelling of arytenoids.

may show themselves on the surface of the swollen parts. Profuse secretion of mucus is also usually present.

Although this is the most typical lesion of tuberculosis in the larynx, and one which cannot well be mistaken, yet the primary manifestations of it are very various, and often present considerable difficulty in diagnosis. In fact the rule might almost be laid down that when in doubt suspect tubercle. One of the earliest lesions sometimes seen is that of a small shallow ulcer on one vocal cord. This may also be met with on one of the ventricular bands, which may be thickened and congested. At the borders of the ulcers some papillomatous outgrowth may

be present. An appearance which should arouse suspicion of the disease is thickening and spine-like projection of the inter-arytenoid fold. Hypertrophy at this particular spot is however met with more frequently in chronic laryngitis, though the papillary outgrowth is not so usually a

FIG. 34.—Tubercle of Larynx. Spine-like projection of inter-arytenoid fold.

feature in the latter. This condition is not likely to be mistaken for true papilloma, as the small excrescences are usually of an inflammatory character in tubercle, and there is some ulceration often present at the same time. The chest and other physical signs would also serve to differen-

FIG. 35.—Tubercle of Larynx. Swelling and ulceration of left ventricular band.

tiate. Tubercle occasionally involves a larynx which has been the site of tertiary syphilitic disease, and the latter may alter the laryngoscopic appearances. Scarring of the tissues and the signs of former deep ulceration are indicative of the former syphilitic element. There is of course

a true syphilitic phthisis, which can be cured by mercury and iodide, and it is probably best, where syphilis is suspected, to resort to these remedies for a time, to see if relief is obtained.

The most prominent symptom complained of in laryngeal phthisis is the dysphagia. This is often extremely troublesome, and the swallowing of liquids in the later stages becomes almost impossible on account of the cough at once brought on. Dyspnœa may be very considerable, but the patient has usually become accustomed to the gradual onset of the stenosis and tracheotomy is rarely absolutely required. Aphonia is usually also more or

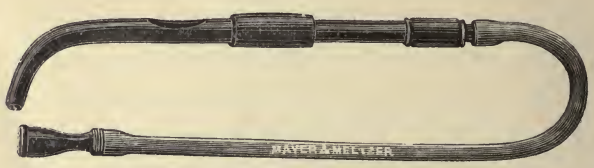

Fig. 36.—Insufflator.

less marked, from the infiltration of the cords and adjoining tissues. Cough, expectoration, and hæmoptysis may be referable to the disease of the larynx as well as that of the chest.

Treatment. — Palliative treatment to relieve symptoms is the main consideration in tubercle of the larynx. Soothing inhalations, such as the Vapor Benzoin and Vapor Pini Sylvestris are useful locally. For the dysphagia morphia insufflations (gr. $\frac{1}{8}$-$\frac{1}{4}$ to starch gr. $\frac{1}{2}$) give most relief.

Lactic acid (10 per cent. to 60 per cent.) has been

strongly recommended by some for healing the ulcers; and scarification has been resorted to first before applying the acid. When the chest is diseased, however, it is at best only a temporary measure, and a somewhat severe treatment to carry out. The best means of applying the acid is by a fine spray.

The swallowing of liquids may sometimes be assisted by drinking them through a small tube.

Constitutional treatment and change of climate are of course of the greatest importance.

The performance of tracheotomy, when the stenosis has come on more rapidly than usual, is sometimes required; and the relief thus obtained may be considerable. The chief disadvantages are the irritation set up by the tube, and the difficulty of expectorating through a canula.

Lupus of the larynx may be met with either secondary to disease of the skin, or as primary lupus of mucous membrane. The disease though pathologically closely allied to tubercle, deserves separate consideration, on account of its slow progress and different prognosis. When the disease commences on the mucous membrane first, the palate and gums are usually first attacked, and then the larynx. The tissues involved are chiefly those affected by tubercle, that is, the arytenoids, epiglottis, and true cords. These tissues become swollen and granular, presenting here and there shallow ulceration. There is not the same pallor that is usually seen in tubercle.

The voice becomes grating and husky, and some dyspnœa may be present. In the later stages, after the

disease has existed many years, the larynx may be narrowed by cicatricial contraction. The long duration and slow spreading of the ulceration serve best to distinguish the disease from syphilis, though the appearances are sometimes somewhat similar; syphilis, however, usually leads to deeper destruction of tissue. Enlarged glands and other signs of struma may also be present with lupus.

Treatment.—Unfortunately it is rarely possible to cauterize in the larynx sufficiently to destroy the lupus growth, which would be the best treatment. Failing this,

FIG. 37.—Lupus of Larynx; showing swelling and granular condition of arytenoids, ulceration of vocal cords, and œdema of epiglottis.

constitutional measures must be relied on. Tonics, and arsenic or mercury in small doses to arrest the growth may be given. Cod-liver oil and sea-air are important.

Typhoid Fever.—The larynx may be affected in very rare instances during the presence of abdominal typhoid; but more usually it occurs as one of the sequelæ, and then is very exceptional. The lesions met with may involve the mucous membrane primarily, or the perichondrium. Ulcers have been met with at the posterior extremities of the cords, without any necrosis of the cartilage, although extending as deeply as the latter. When the disease

attacks the perichondrium primarily, the arytenoids are most frequently affected, and they may be found lying separated from the soft structures in an abscess cavity.

Necrosis of the cricoid and epiglottis have also been observed.

A general thickening of the soft structures may be left by the disease.

Small-pox may affect the laryngeal cartilages, during the stage of convalescence. The arytenoids and cricoid have been found necrosed in a similar manner as in typhoid. The mucous membrane alone may be thickened, with exudation of lymph;* but occasionally it seems to affect the perichondrium first.

Scarlet fever has been observed to be followed, some time afterwards, by necrosis of the cricoid; in a child, aged 8.†

Measles may cause ulceration in the larynx.

Glanders may result in extensive ulceration of the larynx, extending to the cartilages.

Disease of Laryngeal Joints.—Acute inflammation of the crico-arytenoid articulation has been met with from rheumatism, gout (very rare), tonsillitis, and the exanthems.

Ankylosis is met with in rheumatism, typhoid, syphilis, gout, and the exanthems.

The symptoms resemble paralysis, and the vocal cord may be absolutely fixed. Difficult deglutition is also frequently present. Tenderness over the crico-arytenoid

* Specimen, Royal College of Surgeons, No. 3471.

† "Trans. Path. Soc.," vol. xii., p. 52.

region may be felt; and swelling over that articulation is seen with the laryngoscope.

There is a specimen (no. 3461) of disease of the thyro-hyoid articulation in the Royal College of Surgeons. There is calcification of the left thyro-hyoid ligament, with the appearance of an intermediate piece of bone in the joint.

Ossification of Cartilages.—Early ossification of cartilages has probably some bearing on cases of idiopathic perichondritis of the larynx (*q. v.*). There are five specimens of ossification of the cartilages of the larynx and trachea in the College of Surgeons. No mention is made as to the

Fig. 41.—Leprosy of Larynx.

age of the subjects. In one specimen the ossification has occurred first at the posterior and lower border of the cornua of the thyroid cartilage. In another case the order of calcification was thyroid, cricoid, and lastly, arytenoid*; but this succession is not always observed.

Leprosy of the Larynx.—Leprosy involves the larynx in the same way as the skin, with infiltration and thickening of the structures, and the development of tubercles. The epiglottis may become thickened and of a pale greyish colour, with tubercles projecting from the surface; the arytenoids may also be enlarged. The mucous mem-

* E. Canton, "Trans. Path. Soc.," vol. xii., p. 51.

brane becomes anæsthetic like the skin, causing difficulty in swallowing. The voice becomes hissing in character. The adjoining sketch shows the enlarged and tuberculated epiglottis; the tubercles were of a yellow colour, one being bright orange. It is copied from a drawing of the larynx of a leper in Upper Egypt, made by Dr. Mackern.*

Operations for Relief of Stenosis of Larynx.

Laryngotomy.—This operation which is only practicable in adults, is to be recommended for cases of laryngeal stenosis of sudden onset, such as œdema of larynx, &c. It is preferable to tracheotomy in these cases on account of the greater rapidity with which it can be performed. In cases of foreign body, tracheotomy is to be preferred, as laryngotomy hardly allows sufficient space for its extraction; also in cases of malignant disease, where there is probability of the growth extending downwards, tracheotomy should be performed. It has been objected against laryngotomy that the tube causes irritation, and that it is thus ill-adapted for cases where it has to be permanently worn, but this does not appear to be by any means always the case.

The crico-thyroid membrane is almost sub-cutaneous, and may be easily reached by making a vertical incision in the middle line, about an inch in length. The membrane is then incised crosswise to the original incision, and a silver tube curved on the flat, inserted. The only danger in the operation is that of wounding the small

* "Lancet," 1881, vol. ii., p. 129.

crico-thyroid artery, which crosses the membrane; if it bleed it must be twisted or tied.

Tracheotomy may be performed above, through or below the thyroid isthmus; as a rule it is generally simplest to divide the latter, and there seems no material objection to doing so. The patient having been anæsthetised, the shoulders elevated and the head extended, the assistant should keep the neck and chin carefully in the middle line. An incision should then be made over the upper part of the trachea, about an inch and a half in length; if the patient has a short thick neck, it is important to make the first incision a somewhat longer one. The tissues in the middle line are then divided till the trachea is exposed; there is no object in separating them from the sides of the trachea, as it leaves more room for the tube to be inserted alongside instead of into the latter. Any arterial hæmorrhage should be stopped before opening the windpipe, but venous hæmorrhage may be disregarded unless very excessive, as it ceases on the introduction of the tube. A few cases have unfortunately been lost from excess of venous hæmorrhage blocking the bronchi, immediately on introduction of the tube, but these are instances of extreme engorgement of veins due to great stenosis, and in which it is impossible to wait long for it to subside. The left forefinger should be used throughout the operation as a guide to the relation of parts. Before opening the trachea and inserting the tube, a sharp hook should be fixed into the former just below the cricoid cartilage, and the opening should be made by cutting up to this with the knife. The reason for cutting upwards is to avoid the

possible danger of wounding an artery or aneurism crossing the trachea. The knife should not be inserted too deeply, or wound of the posterior wall of the trachea or œsophagus may occur. It is essential in making the incisions to keep in the middle line, otherwise the tube will be tilted, and not only cause subsequent discomfort, but will soon become blocked with mucus. The difficulty in inserting the tube lies in the flexibility of the trachea, which evades the point of the former, and allows it to be easily pushed into the adjoining tissues. This is avoided by retaining the sharp hook in the trachea, until the tube is finally inserted.

The operation should of course be always completed however hopeless the case may seem, and artificial respiration resorted to.

If the object of the operation has been the removal of a foreign body, the sides of the wound should be held apart with forceps to allow of its exit if possible. The best tube to use is that of Durham, with a moveable shield for adjusting its length, and a lobster tail inner canula. The remaining portion of the wound may be brought together by strapping.

The after treatment consists in maintaining a warm atmosphere, extracting and cleaning the inner canula, and replacing it well oiled, and also maintaining the patient's strength.

Thyroid Tumours causing pressure on the Trachea or the Laryngeal Nerves.—Thyroid tumours assume special and grave importance when they begin to cause pressure-symptoms in the larynx or

trachea, and the exact nature of the obstruction given rise to can only be accurately diagnosed by the use of the laryngoscope. As regards the larynx, their influence is chiefly exerted by causing irritation of the recurrent laryngeal nerves, and in this way spasm of the glottis. That spasm is not infrequently the first result of this pressure on the nerves would appear to be indicated by the paroxysmal nature of the dyspnœa. When, however, the nerve has become more severely compressed paralysis takes place, and the usual rule is observed of the abductor fibres suffering before the adductors. This is more often unilateral, but should it be bilateral the dyspnœa becomes severe. When the nerves have become completely paralysed the cords assume the cadaveric position, and the dyspnœa is relieved. Pressure on the main trunk of the pneumogastric may also take place, and besides laryngeal dyspnœa being caused, cardiac syncope may be given rise to; this exceptional result usually occurs in tumours of a malignant nature. These malignant tumours may involve the larynx itself, and so cause direct stenosis; but innocent tumours of the thyroid rarely cause any direct compression of the larynx.

In the case of the trachea, however, the danger of compression by a simple enlarged thyroid is far greater, and is the most frequent cause of dyspnœa given rise to by these tumours. It is the lateral lobes, and not the isthmus, which cause the compression; lateral flattening of the trachea being the common, and antero-posterior an exceptional result. Circular constriction is practically unknown. The compression may be unilateral or bi-

lateral, according to the disposition of the tumour; with unilateral hypertrophy, twist and displacement of the trachea is also specially liable to take place. An inch below the cricoid is a frequent site of the greatest constriction of the trachea. The amount of pressure exerted does not necessarily bear relation to the size of the hypertrophied gland, some small tumours, not noticed by the patients themselves, having been known to cause severe dyspnœa; it seems rather to depend on the amount of resistance the tumour has met with to its outward growth, and specially as to whether it has grown under the clavicle. In these latter cases the length of the compressed portion may be considerable, and the ordinary tracheotomy tube may quite fail to reach to the site of obstruction. The wall of the trachea has not infrequently become so collapsed in cases of long-standing pressure, that it fails to recover itself when the cause of pressure is removed.

On laryngoscopic examination, one or other of the vocal cords may be seen to be impaired in its movements.

Spasm of the glottis, abductor paralysis, or complete paralysis of one or both cords may be found. As a rule, however, the cords are seen to move normally, and it is in the trachea that the seat of obstruction is to be looked for. When the wall of the latter has become pushed in, it presents as a red swelling on one or both sides, below the level of the vocal cords. If bilateral only a narrow chink may be left for the passage of air. The rings of the trachea may be with difficulty recognisable in the projection, but its nature is to be suspected by its uniform shape·

The symptoms are those of constant or paroxysmal dyspnœa; the latter as previously stated being probably due to irritation of the recurrent nerves causing spasm of the glottis. Death has been known to take place from this cause in an exceptional case, where no compression of any part of the windpipe was found. The dyspnœa may also be made worse by sudden attacks of enlargement of the gland, which occasionally take place, apparently due to vascular engorgement. When the trachea has become pressed in on both sides the breathing may be stridulous, and excessively noisy during sleep.

Treatment.—When once a thyroid tumour has begun to cause pressure-symptoms, medication is rarely efficacious in reducing it; and operative treatment should not long be delayed.

The liniment of iodine may be painted on the gland, or the biniodide of mercury ointment rubbed in. The tinctures of iodine and iron in combination may also be given internally. Failing, however, these remedies, and with dyspnœa in any way serious or progressing, operation should be resorted to. The choice of this measure lies between division of the isthmus, tracheotomy, or removal of one-half of the gland. Removal of the whole gland should of course never be performed. Division of the thyroid isthmus was recently an operation of much repute, on account of the speedy diminution in the size of the gland which followed its performance. This result takes place probably from the free exudation of the fluid contents of the gland at the wound.* The operation is,

* Mr. James Berry's "Jacksonian Prize Essay," to which the author is much indebted for other facts.

however, not without risk, and its results are not permanent; as the gland is apt to enlarge again as soon as the wound closes, and it being the lateral lobes which cause the dyspnœa, no good can be obtained by removal of the isthmus if the former remain large.

Palliative tracheotomy is hardly to be recommended, unless removal of the hypertrophied gland is impracticable, as it gives the patient little chance of permanent cure, and may require the wearing of a very long canula to reach below the site of obstruction. Removal of one-half of the gland, and that portion of course from which the pressure seems to arise, is therefore the best operative measure to be adopted. The operation should be performed in the following manner. An incision should be made over the middle of the tumour of sufficient length to allow free manipulation of the tumour. Having cut through the skin, the rest of the tissues should be divided on a director down to the investing membrane, or fascia propria of the gland. Care should be taken as far as possible not to wound any veins. Venous hæmorrhage occurs mainly at the early part of this operation. The fascia propria should then be divided upon the director, and the capsule of the gland will be exposed. Care should be taken not to tear the capsule as the veins lie in deep grooves on the surface of it; and beneath it they are very thin walled and may be easily torn. The rest of the operation should be done with the fingers and handle of the scalpel, the gland being separated all round from the fascia propria. Arterial hæmorrhage comes from either the superior or inferior thyroid arteries, or exceptionally

from the thyroidea ima, an artery occasionally present. The superior thyroid runs along the inner and anterior border of the gland mass giving off vessels on the way. The inferior thyroid enters the inner and posterior part of the lateral lobe. Both arteries may be much enlarged. If however the finger is kept close to the tumour during excision, there is very little danger of wounding these vessels before they have broken up into smaller branches, or of wounding the recurrent laryngeal nerve which lies in varying relation to the inferior thyroid artery, being sometimes posterior and inside, and occasionally outside. No large masses should be ligatured on the suspicion of their containing vessels, as this conduces to suppuration, but the artery should if detected be separated from its surrounding tissues and tied. Probably the best method is to go straight on with the removal of the gland in the way above indicated, and to subsequently ligature bleeding points.

Other dangers of the operation are entrance of air into a vein, which has been known to be fatal; injury to the trunk of the pneumogastric; injury to the trachea on account of the close connection of the cervical fascia covering the thyroid gland with that investing the posterior surface of trachea; and finally injury to the pleura. All these dangers are, however, to be avoided by care in keeping close to the gland, and not using the knife. No strong solutions of any sort should be used to the wound; and carbolic acid is best avoided. A solution of perchloride of mercury (1-2000) is the best antiseptic to use. The pedicle may be transfixed with a blunt curved

needle, armed with a double ligature, and the two halves tied.

The wound having been sewn up, it should be kept in apposition by pressure of sponges, in order to ensure primary union, and to arrest any hæmorrhage which may occur from the general surface. It is exceedingly important to keep the patient's head and neck absolutely still for some days after the operation, and the head, neck, and shoulders may be included in the bandaging. Septic inflammation is the most common cause of death, and should tracheotomy have to be performed, a fresh wound may be made for the introduction of the canula.

SECTION IV.

Diseases of the Larynx in the Lower Animals.

Inflammations.—Laryngitis is met with in many of the lower animals in acute and chronic forms, resembling in all its features the catarrhal form in man. A case is recorded in a white-lipped peccary, in which the mucous membrane became red and inflamed, and ashy-grey patches formed; the membrane sloughing in places and readily peeling.* Domestic pigeons are subject to a disease in which diphtheria-like membrane forms in the larynx. Microscopical examination reveals a different bacillus than that found in human diphtheria. Calves are also subject to a form of diphtheria, which affects the nose, mouth, and larynx. There is a specimen in the Royal Veterinary College of a pig's larynx, showing the whole of its interior obstructed by false membrane, a condition as far as the specimen is concerned fairly analogous to diphtheria. Unfortunately no details are known concerning it, beyond the fact that the disease attacked several pigs at the same time. No similar outbreak has been met with since at the Veterinary College.

Laryngismus stridulus is met with occasionally in horses, from no definite known cause.

Perichondritis.—The only specimen of necrosis of the cartilages that I am acquainted with, was obtained by

* "Trans. Path. Soc.," vol. xii., p. 243.

my father from a young otherwise healthy boar-pig. The animal had been ill only a few days, and suffered from symptoms resembling croup, the breathing being stridulous. No cause could be assigned. On examination the larynx showed inflammatory deposit round the cricoid cartilage, a portion of which had necrosed, and was lying loose in an abscess cavity. This with the inflammation of the mucous membrane had caused the obstructed respiration. It seems just possible that this may have been a case of actino-mycosis, a disease affecting cows and swine, and occasionally attacking the larynx.

Perichondritis is said to occur also in the horse in very rare instances.*

New Growths.—Polypus has been met with occasionally in the larynx of cows; and growths have also been found in the horse and dog. Mackenzie records a case of papilloma in a dog, growing from the left vocal cord, with a smaller growth on the right vocal cord, also a fringe of growths on the ventricular bands (*see* Plate I., fig. 1). There is a specimen of growths from the epiglottis of a horse in the Veterinary College Museum; and also a specimen of growths in the trachea of a dog (*see* Plate I., fig. 2).

Paralysis.—The chief form of paralysis in the larynx is met with in horses; and is the condition known as "Roaring." It is due to atrophy of the muscles on the left side of the larynx, caused by paralysis of the left recurrent nerve. No other cause has been met with.† The

* Fleming, "Roaring in Horses."

† "Ibid."

disease of the nerve is most frequently due to pressure of enlarged thoracic glands.

The bronchial glands may become diseased, in strangles, bronchitis, pneumonia, &c.; strangles having by far the largest share. A few cases have been recorded of paralysis on the right side as well, the disease being not so marked as on the left side; but practically bilateral paralysis is unknown in horses. The condition of atrophy of the muscles on the left side is seen in Plate II. This larynx was taken from a "roarer," in which no disease could be found to account for the nerve paralysis.

Roaring is strongly hereditary; cases having been met with in which it was transmitted to the third generation, and several sires have been known to breed roarers frequently among their progeny.

Glanders.—The manifestations of this specific disease in the larynx are first the formation of tubercles; which rapidly break down, and form unhealthy looking ulcers, secreting pus. The ulceration may involve any part of the larynx or trachea. It soon spreads deeply into the subcutaneous tissues. When healing takes place, it may be followed by cicatricial contraction and stenosis. It unfortunately sometimes occurs in man from inoculation; a severe case of stenosis has been recorded in a boy.*

* "Trans. Path. Soc." vol. xv.

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